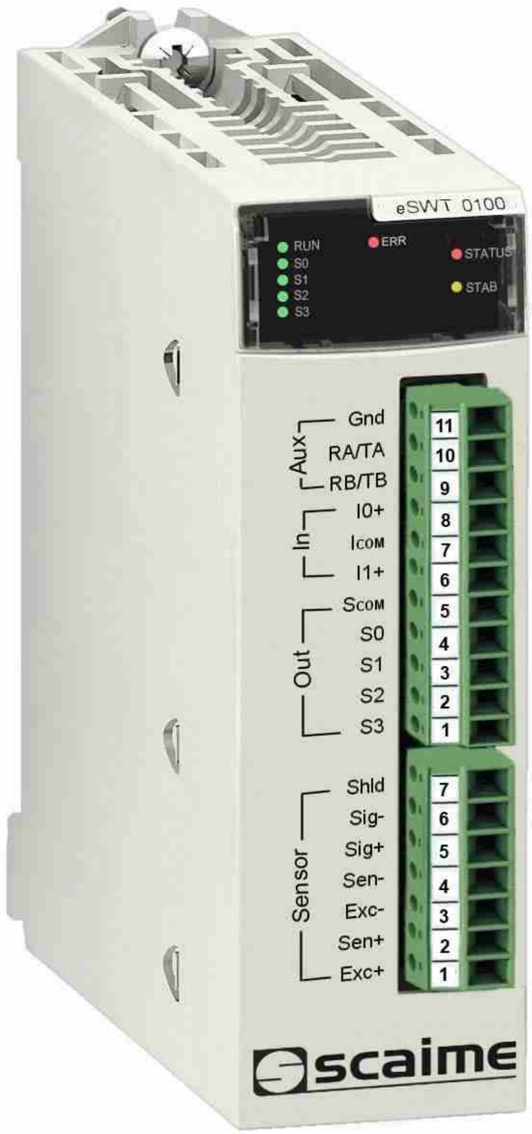
User Manual

PME SWT 0100

Weighing module

For Schneider Electric MX80



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SCAIME SAS – Technosite Altéa – 294, Rue Georges Charpak – 74100 JUVIGNY - FRANCE

Tél. : +33 (0)4 50 87 78 64 – www.scaime.com

1. Safety information

1.1.1. Notice

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER
DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING
WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION
CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

NOTICE
NOTICE is used to address practices not related to physical injury.

1.1.2. Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by SCAIME for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

1.1.3. Before you begin

Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to the operator of that machine.

⚠ WARNING
UNGUARDED MACHINERY CAN CAUSE SERIOUS INJURY • *Do not use this software and related automation equipment on equipment which does not have point-of-operation protection.* • *Do not reach into machinery during operation* ***Failure to follow these instructions can result in death, serious injury, or equipment damage.***

This automation equipment and related software is used to control a variety of industrial processes. The type or model of automation equipment suitable for each application will vary depending on factors such as the control function required, degree of protection required, production methods, unusual conditions, government regulations, etc. In some applications, more than one processor may be required, as when backup redundancy is needed.

Only the user can be aware of all the conditions and factors present during setup, operation, and maintenance of the machine; therefore, only the user can determine the automation equipment and the related safeties and interlocks which can be properly used. When selecting automation and control equipment and related software for a particular application, the user should refer to the applicable local and national standards and regulations. The National Safety Council's Accident

Prevention Manual (nationally recognized in the United States of America) also provides much useful information.

In some applications, such as packaging machinery, additional operator protection such as pointof- operation guarding must be provided. This is necessary if the operator's hands and other parts of the body are free to enter the pinch points or other hazardous areas and serious injury can occur.

Software products alone cannot protect an operator from injury. For this reason the software cannot be substituted for or take the place of point-of-operation protection.

Ensure that appropriate safeties and mechanical/electrical interlocks related to point-of-operation protection have been installed and are operational before placing the equipment into service. All interlocks and safeties related to point-of-operation protection must be coordinated with the related automation equipment and software programming.

NOTE: Coordination of safeties and mechanical/electrical interlocks for point-of-operation protection is outside the scope of the Function Block Library, System User Guide, or other implementation referenced in this documentation.

1.1.4. Start up and test

Before using electrical control and automation equipment for regular operation after installation, the system should be given a start-up test by qualified personnel to verify correct operation of the equipment. It is important that arrangements for such a check be made and that enough time is allowed to perform complete and satisfactory testing.

CAUTION

EQUIPMENT OPERATION HAZARD

- *Verify that all installation and set-up procedures have been completed*
- *Before operational tests are performed, remove all blocks or other temporary holdings means used for shipment from all component devices.*
- *Remove tools, meters and debris from equipment.*

Failure to follow these instructions can result in injury or equipment damage.

Follow all start-up tests recommended in the equipment documentation. Store all equipment documentation for future references.

Software testing must be done in both simulated and real environments.

Verify that the completed system is free from all short circuits and grounds that are not installed according to local regulations (according to the National Electrical Code in the U.S.A, for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to prevent accidental equipment damage.

Before energizing equipment:

- · Remove tools, meters, and debris from equipment.
- · Close the equipment enclosure door.
- · Remove all temporary grounds from incoming power lines.
- · Perform all start-up tests recommended by the manufacturer.

1.1.5. Operation and adjustment

The following precautions are from the NEMA Standards Publication ICS 7.1-1995 (English version prevails):

Regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components; there are hazards that can be encountered if such equipment is improperly operated.

It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer's instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer's instructions and the machinery used with the electrical equipment.

Only those operational adjustments actually required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics.

2. About the book

2.1.1. Document Scope

This document describes the PME SWT weighing module that can be used in X80 RIO drops.

NOTE: The specific configuration settings contained in this guide are for instructional purposes only. The settings required for your specific application can be different from the examples presented in this guide.

NOTE: The architectures described in this document have been tested and validated in various scenarios. If you intend to use architectures different than the ones described in this document, test and validate them thoroughly before implementing.

2.1.2. Validity note

This document is valid for X80 remote I/O systems when used with Unity Pro 8.0 or later. The technical characteristics of the devices described in this document also appear online.

The characteristics that are presented in this manual should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the manual and online information, use the online information as your reference.

2.1.3. Product Related Information

WARNING

UNINTENDED EQUIPMENT OPERATION

The application of this product requires expertise in the design and programming of control systems. Only persons with such expertise should be allowed to program, install, alter, and apply this product.

Follow all local and national safety codes and standards. Failure to follow these instructions can result in death, serious injury, or equipment damage.

2.1.4. Disclaimer

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Scaime nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information that is contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

No part of this document may be reproduced in any form or by any means, electronic or mechanical, including photocopying, without express written permission of Scaime.

All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Scaime software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

3. Introduction

3.1. General information

PME SWT is a versatile and flexible weighing module controller, which can be used wherever weighing scales are to be used in the Schneider Electric Mx80 automation system.

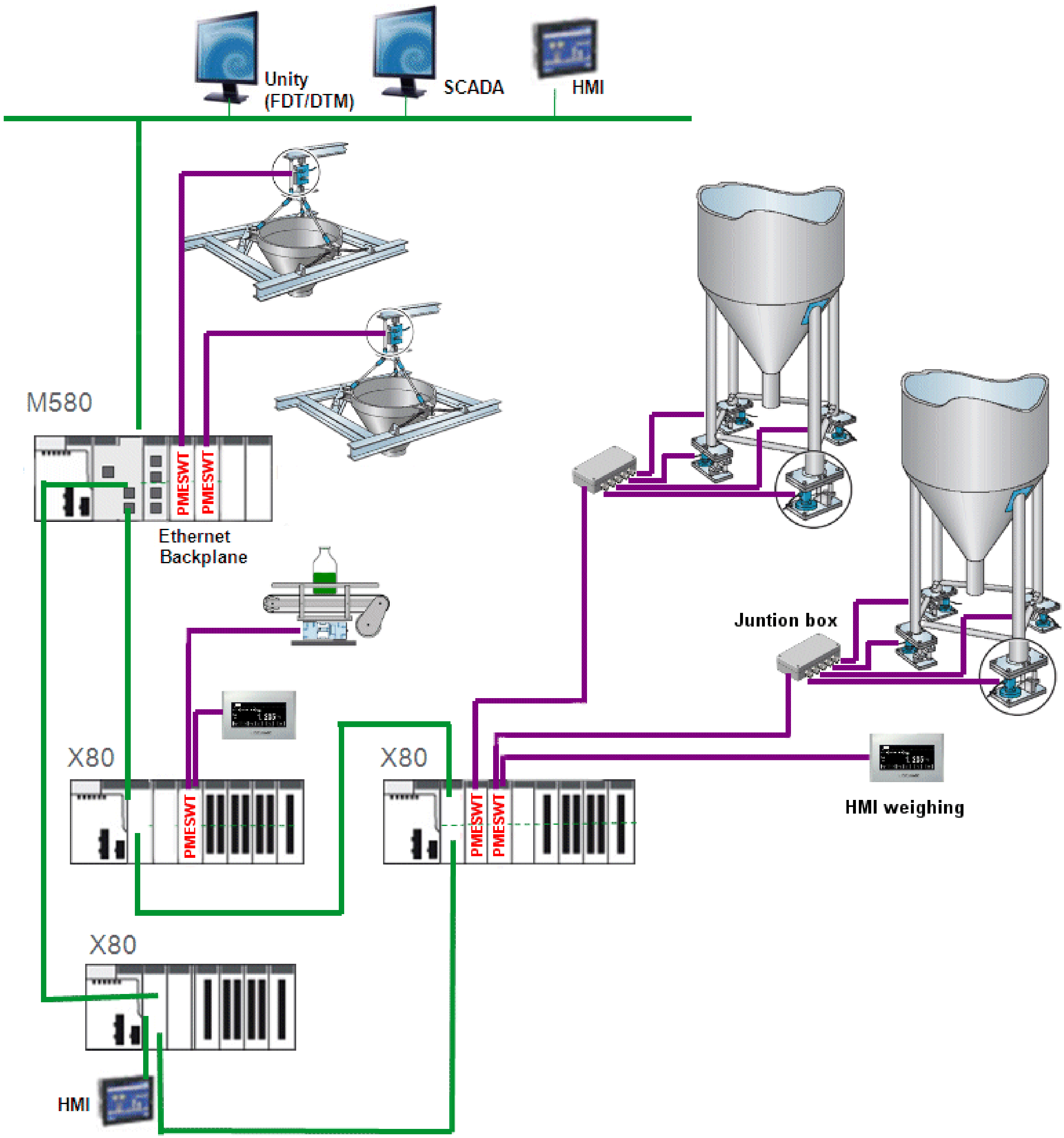
The function module PME SWT takes full advantage of all the features of the modern automation system:

- Install on either M580 local CPU rack or X80 RIO rack of Ethernet backplane
- Uniform design technology and consistent communication via Ethernet backbone
- Uniform configuration with UNITY V8.0 or latter.
- Configuration, calibration and diagnose via FDT/DTM.
- Measurement of weight or force with high resolution of 24 bits A/D converter
- High weighing accuracy 0.01 %
- External Measurement response time of 10ms
- Internal measurement rate up to 400 Hz
- 2 Digital outputs for monitoring of limit values
- 2 Digital outputs for 2-feeds dosing control
- Parameter definable inputs and outputs
- Continuous flow rate calculation
- Theoretical adjustment possible without adjustment weights
- RS485 communication port for dedicated local HMI
- Factory Pre-calibration
- Replacement of the module possible without a new adjustment of the scale
- Use in Hazardous area zone 2 and 22 (ATEX approval), class I division 2 (cULus approval)
- Intrinsically safe load cell powering for the hazardous area Zone 1 (With optional SCAIME Zener barrier kits)

3.2. Product presentation

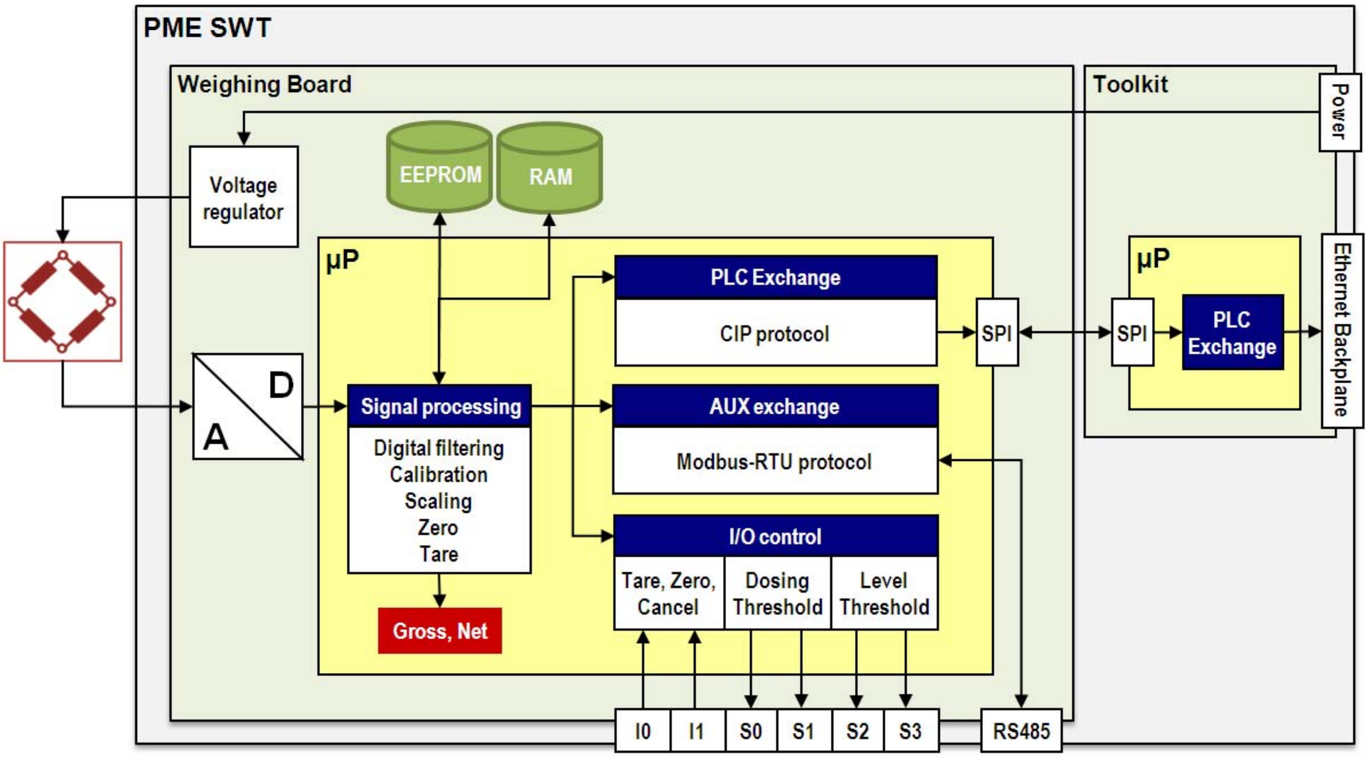
PME SWT is a weighing module controller of the M580 and X80 system. Operation of the PME SWT in M580 and X80 system architecture guarantees complete integration of weighing technology in the automation system.

- Install on either M580 local CPU rack or X80 RIO rack of Ethernet backplane.
- Weighing data can be transferred from weighing module to M580 CPU, Unity and the network via Ethernet backbone
- Unity to configure, monitor and diagnose the weighing module via FDT/DTM



3.2.1. Architecture

The following operation diagram shows the architecture and processes executed by the PME SWT module:

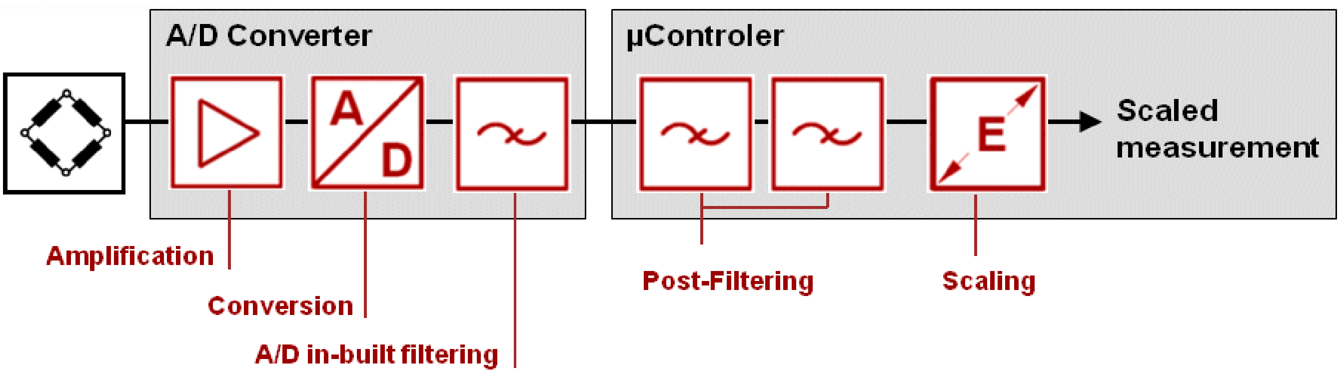


3.2.2. Signal processing

The goal of signal processing is to provide a filtered and scaled measurement to the user. The signal processing is the software part in charge of the metrological functions:

- Digital filtering
- Measurement scaling
- Zero, Tare functions
- Measurement stability control
- Flow rate calculation
- Calibration

The following diagram shows the signal processing operations:



3.3. Operational and Environmental Recommendations

3.3.1. General

The quality of the measurement provided by the module may be reduced considerably if the sensor set-up and installation precautions have not been observed. Thus in place of exhaustive information, these few lines should make you aware of some of the precautions which need to be taken.

3.3.2. Dividing up the loads

In a measurement system, the weighing sensors support the following weights:

- the maximum weight to be weighed,
- The weight of the loading receiver and its structures (or metrological tare).

This total weight is divided up between 1, 2, 3, 4, 6, even 8 sensors. The design of the mechanical structures, the shape of the loading receiver and the dividing of the load on or within the receiver, means that the total weight is not always equally divided between all the sensors (except of course in the case of a single sensor).

It is therefore a good idea to make sure that the dimensions of the weighing sensors are calculated in such a way as to be able to support the total weight (maximum weight + tare) to which they will be subjected

3.3.3. Inhibiting interference on the load receiver

As a weighing sensor deflection is very weak (a few tenths of a millimeter), all interference on the load receiver or any friction on the permanent framework will cause an invalid weight measurement and make correct adjustment of the module impossible.

3.3.4. Mechanical installation of the weighing sensors

The sensors in traction or compression must be used vertically respecting their action direction (traction or compression). The maximum admissible tolerance on the installation's verticality is in the region of the degree according to the installation and the required precision.

3.3.5. Protecting the sensors from interference currents

It is recommended that each sensor be provided with a mass flex which plays the role of the electric "shunt" with the aim of protecting sensors from currents capable of circulating in the metallic framework (ground currents, from the terminal to be connected, and electrostatic discharges…). This flex will be of a sufficient length to not result in mechanical constraints and it will be placed directly next to the sensors, between the permanent framework and the load receiver.

3.3.6. Contact with water and corrosive products

Weighing sensors are manufactured as waterproof. It is recommended, however, that they be prevented from coming into contact with water, corrosive products and direct sunlight.

3.3.7. Preventive maintenance of the installation and accessories

The weighing module requires no special maintenance. The weighing sensors, however, should be cleaned periodically if used in a difficult environment.

It is advisable to periodically test and service the mechanical state of the load receiver.

- Cleaning the receiver and its structures because of a product deposit or various material
- Deposits may result in a noticeable variation of the tare.
- Checking the verticality of the weighing sensors.
- Checking the sensor and actuator states according to their period of use.
- Etc...

WARNING

Statistics show that 90% of breakdowns occurring on a weighing/dosing installation are not attributable to the electric command device, but to the installation itself (defective limit switches, mechanical faults…).

4. PME DTM Library Installation/Uninstallation Guide

This document explains the installation/uninstallation PME DTM Library in general:-

4.1. System Platforms

PME DTM Library can be installed on different Windows platforms using the same setup package. The setup will detect the platform and the specific installation requirements automatically. The following Windows platforms are supported:

- Windows XP Professional (SP3 or higher)
- Windows 7 32/64-bit (Professional or Ultimate Edition)
- Windows Vista 32/64-bit (Professional or Ultimate Edition)

4.1.1. Minimum Resource Requirements

Please verify that the target system meets the following minimum requirements:

- Processor type: Intel Pentium single core or compatible platforms with 1GHz
- Processor speed: 1.2GHz (recommended 3.0 GHz)
- Memory: 1024 MB (2048 MB recommended)
- Display: 800x600, 256 colors (1024x768 recommended)
- Free hard disk space on system drive: 8 GB(recommended 20 GB)
- Web Access : Microsoft Internet Explorer 5.5 or higher

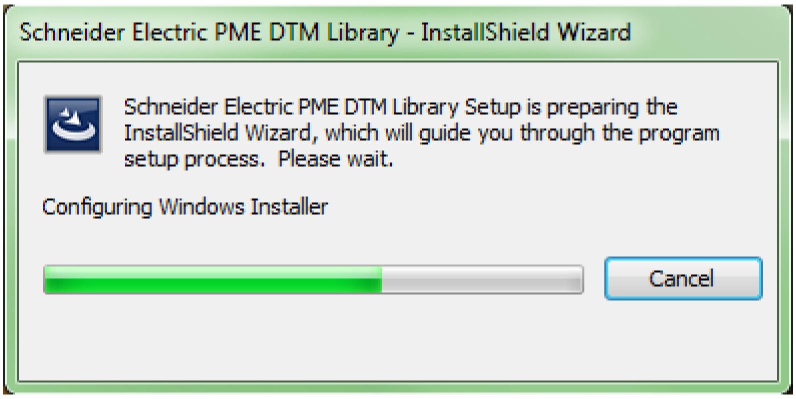
4.1.2. Software Requirements

The Generic Modbus DDXML DTM requires the following software installed on the PC:-

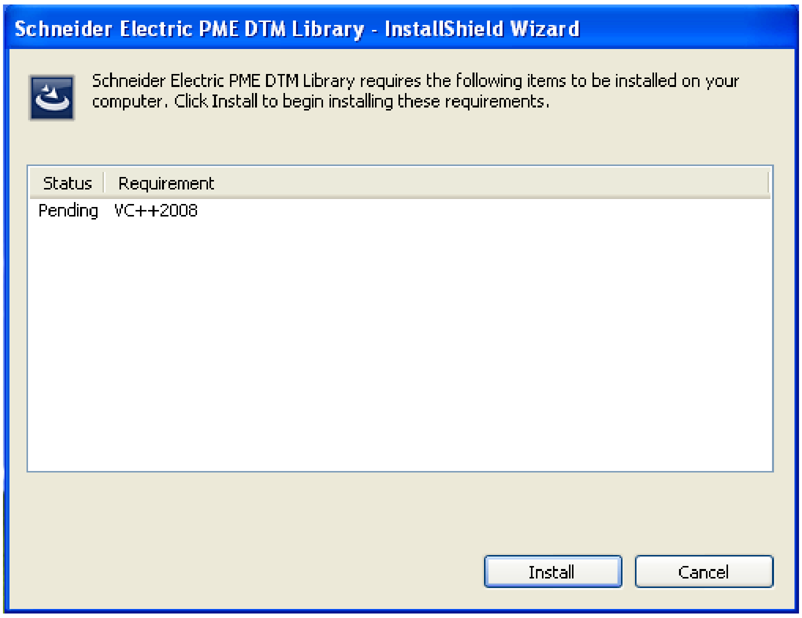
- Microsoft .NET Framework V3.5 SP1
- UnityPro V8.0 / FDT Frame Application compliant to the FDT standard.
- M580 Master DTM/Any EIP Master DTM

4.2. Detailed Installation Guidelines

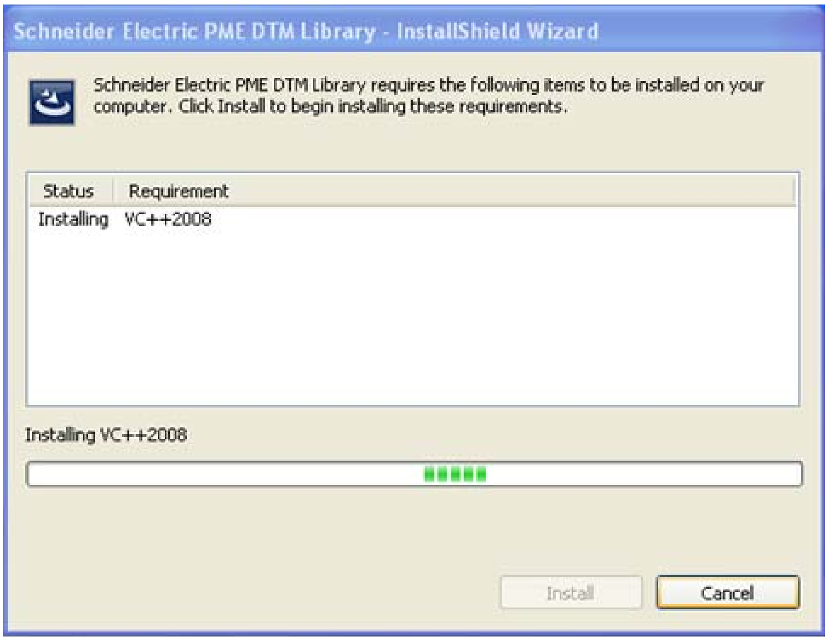
- Double click on the installer (.exe file) of the PME DTM Library named “Schneider Electric PME DTM Library” to configure the windows installer as shown in the image below.



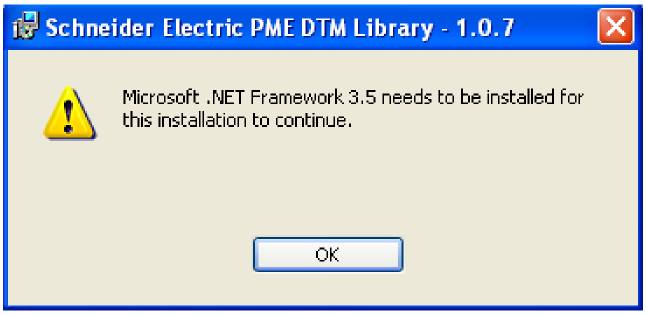
- Then the library will look for the pre-requisites (Software Requirements) in the target system, if not available then the installation setup will prompt for their installation as shown in image below.



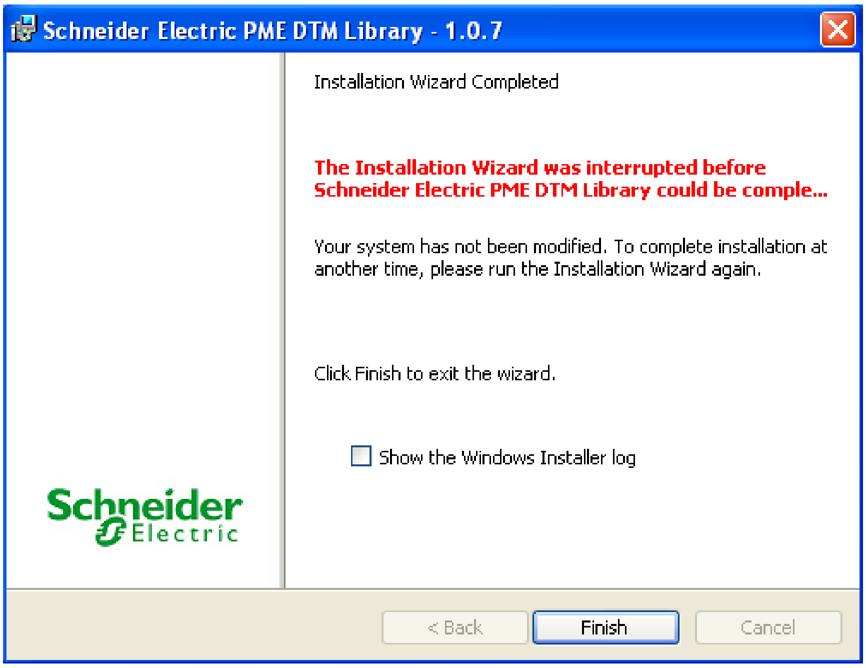
- Click on install to proceed and then the installation of the missing components will get initiated as shown in image below.



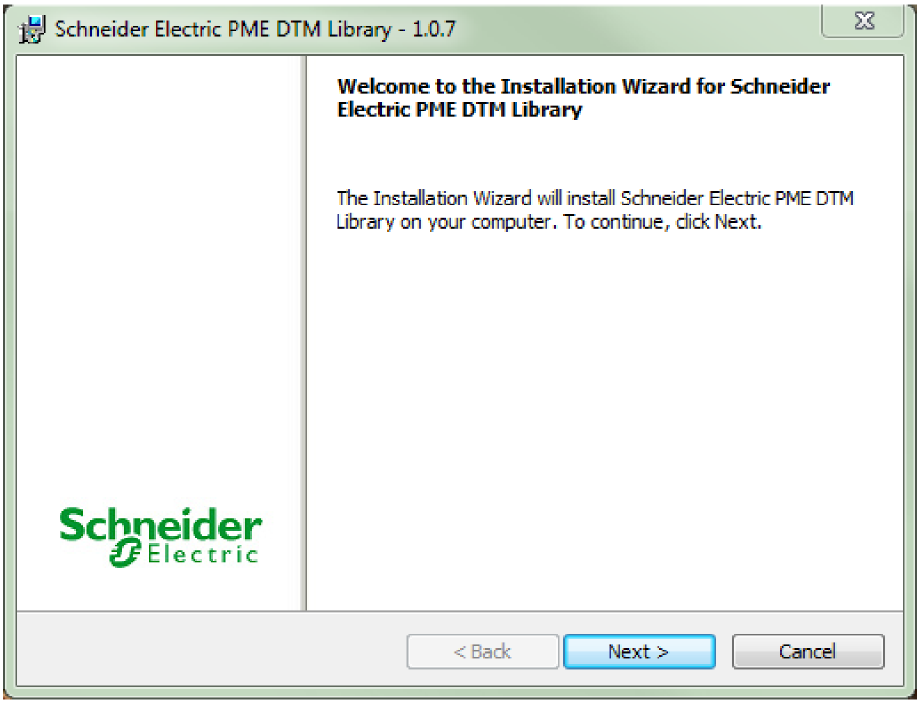
- After all the prerequisites (except .NET Framework) get installed the setup will look for .Net framework installation. If missing an error notification will be pop up as shown in the image below.



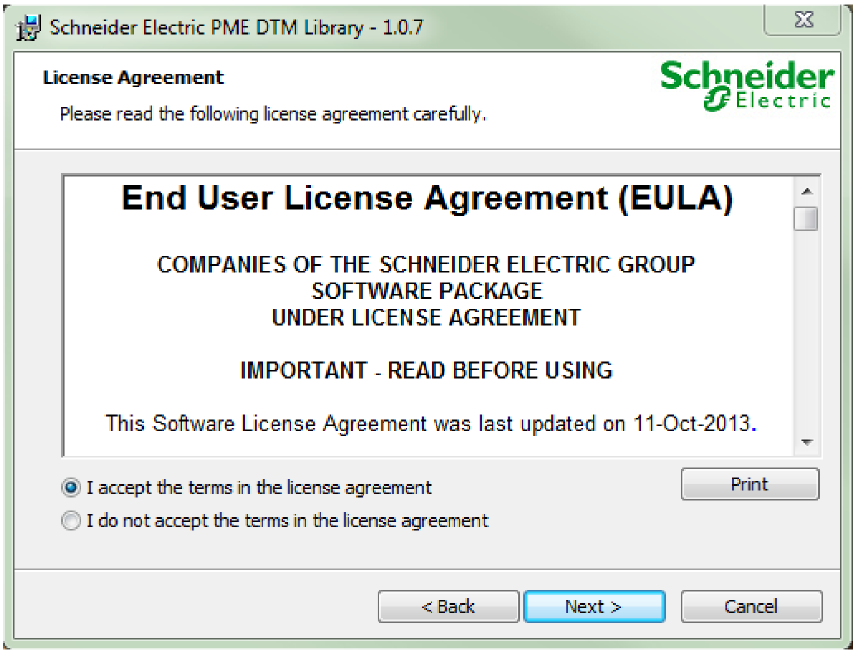
- Clicking on OK aborts the installation as shown in the image below.



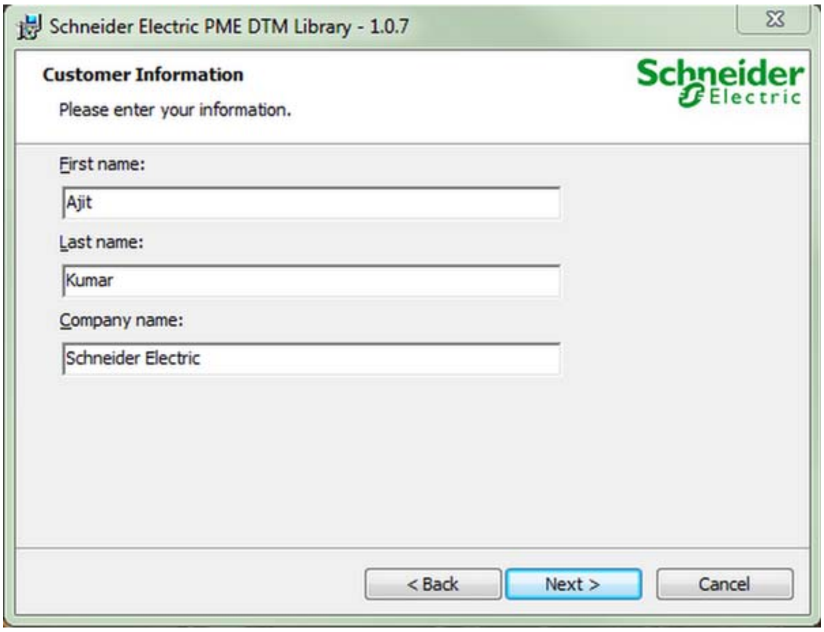
- User will need to install the framework (as .Net Framework is not shipped with the Library Setup) and then restart the library installation.
- After all prerequisites are successfully installed/found in the target machine the installation will start as shown in the image below.



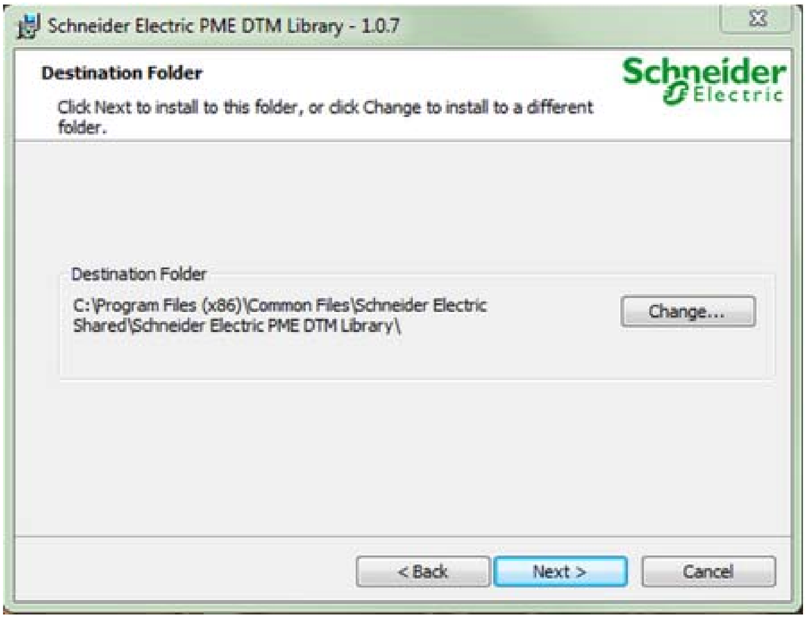
- Accept the End User License Agreement to proceed as shown in the image below.



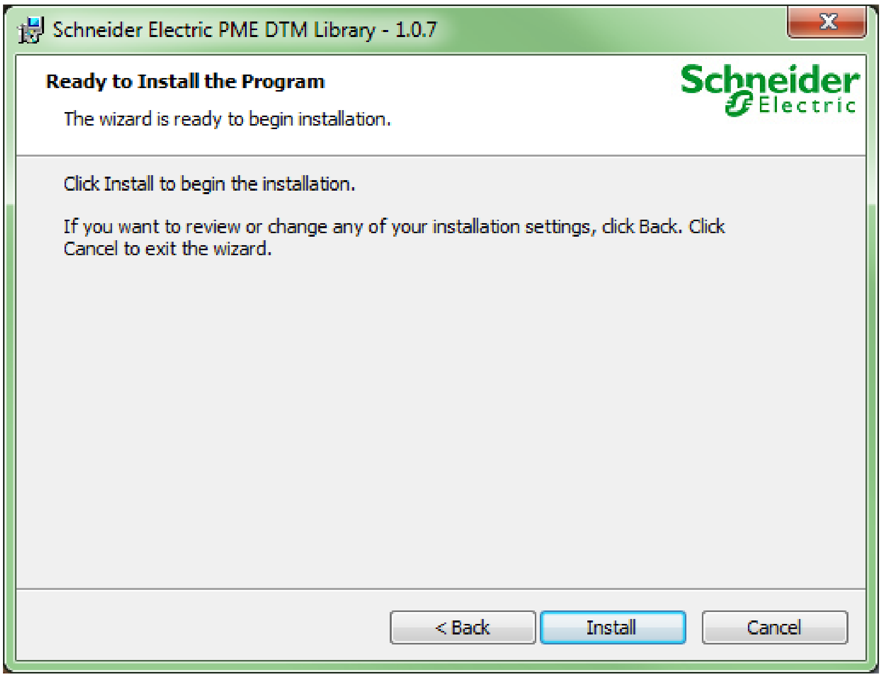
- Enter the Customer Information.



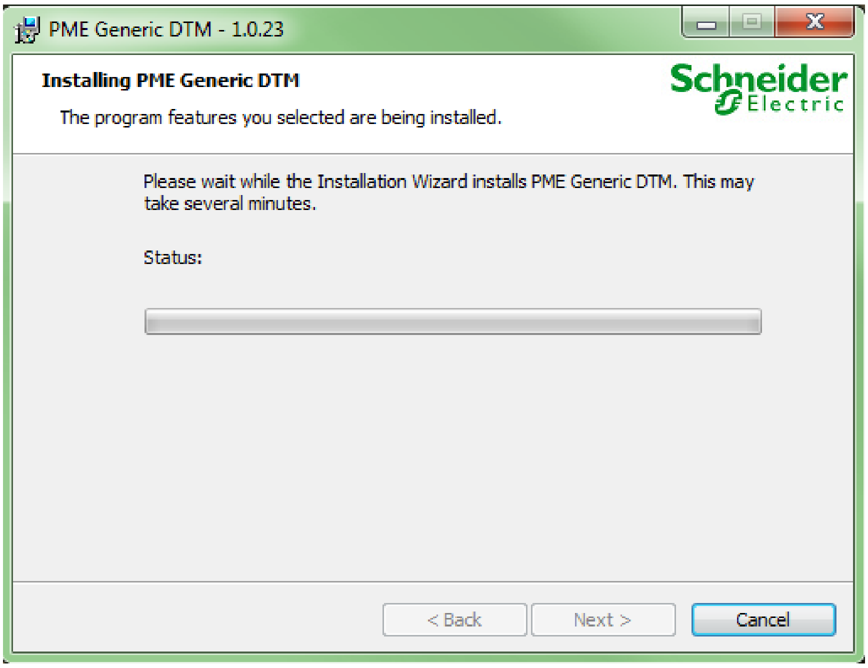
- Configure the Destination Folder(by clicking on Change.Click on Next to proceed) as shown in the image below.



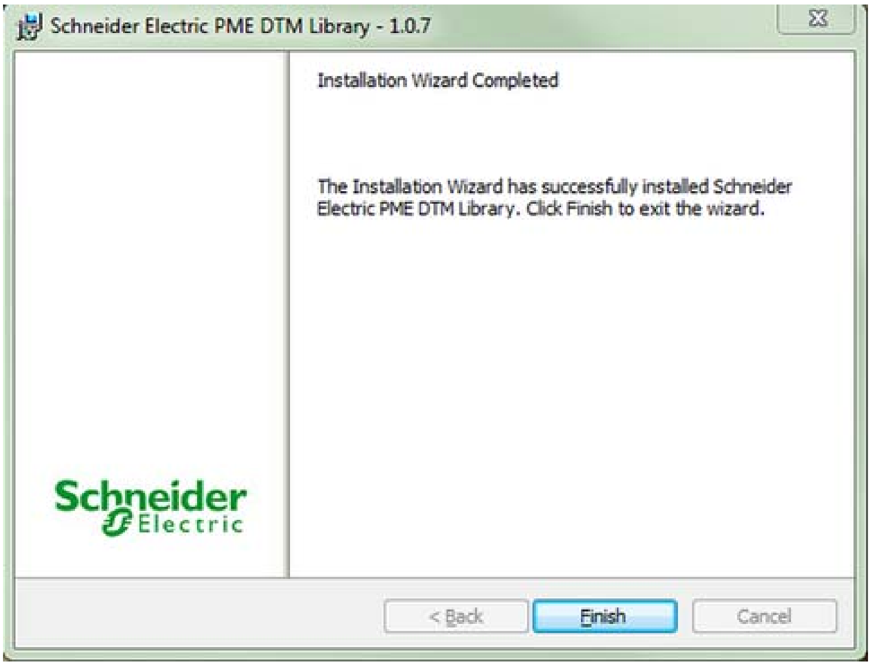
- Click on Install to proceed as shown in the image below.



- The installation of the library will then start as shown in the image below.

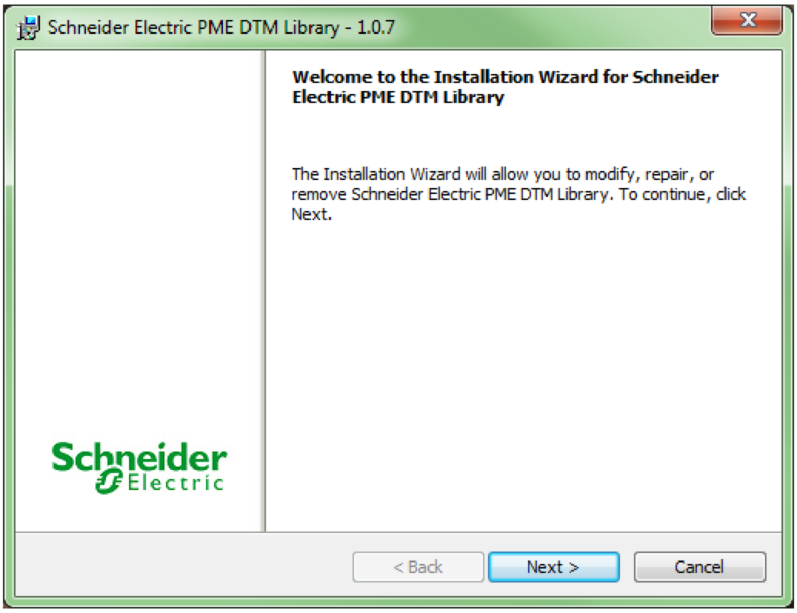


- If all goes right installation will get successfully completed as shown in the image below.


Schneider Electric PME DTM Library - 1.0.7
Installation Wizard Completed
The Installation Wizard has successfully installed Schneider Electric PME DTM Library. Click Finish to exit the wizard.
Schneider Electric
< Back
Finish
Cancel

4.3. Detailed Uninstallation Steps

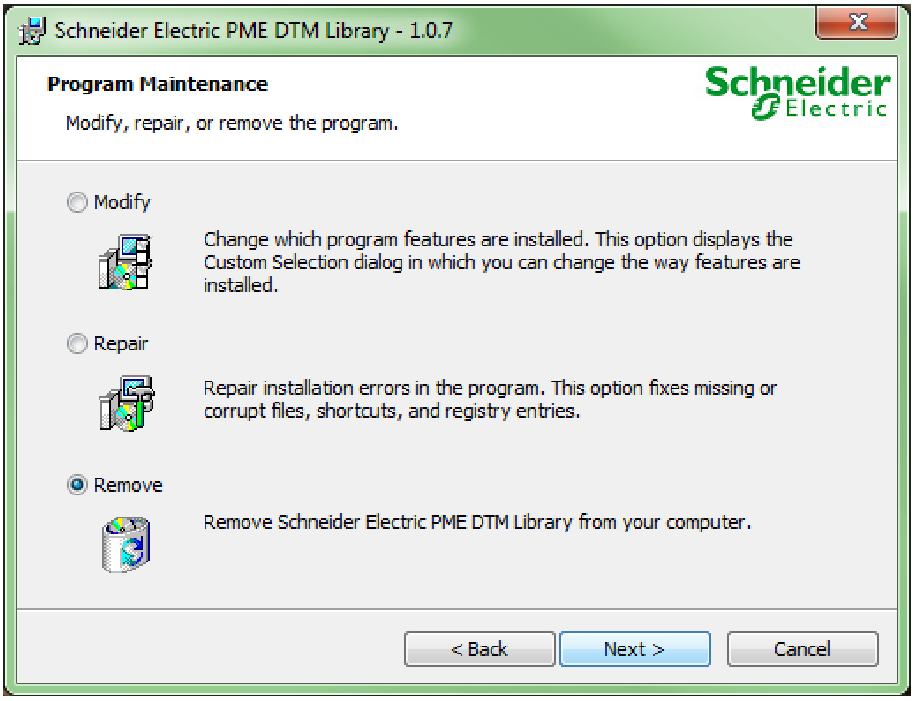
- Go to the control panel and then go to “Add or Remove Programs” in case of windows XP, OR, go to “Programs and Features” in case of Windows 7, then select the entry “Schneider Electric PME DTM Library” from amongst the programs and thereafter click on “Change” to initiate the Uninstallation.
- Click on Next to start the uninstallation as shown in the image below.



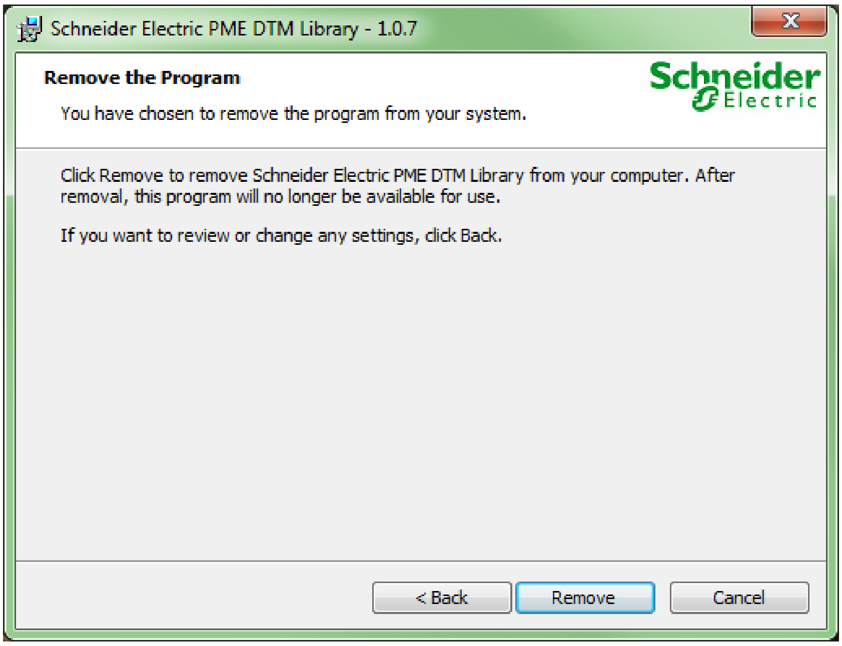
After that select the appropriate option from amongst

- Modify : To change which program features are installed. This option displays the Custom Selection Dialog in which you can change the way features are installed.
- Repair : To Repair installation errors in the program. This option fixes missing or corrupt files, shortcuts and registry entries.
- Remove : To Remove Schneider Electric PME DTM Library from your computer.

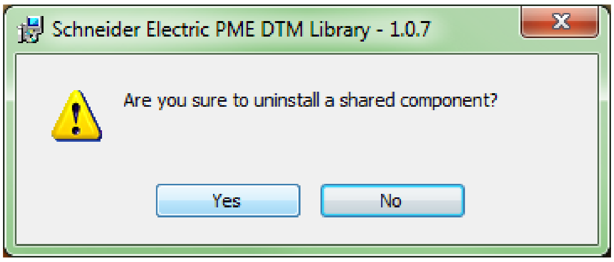
If you want to uninstall the PME DTM Library then select Remove option and click on Next as shown in the image below.



- The setup will then confirm the option you just selected and will also give you an option to navigate back. To continue the uninstallation click on Remove as shown in the image below.

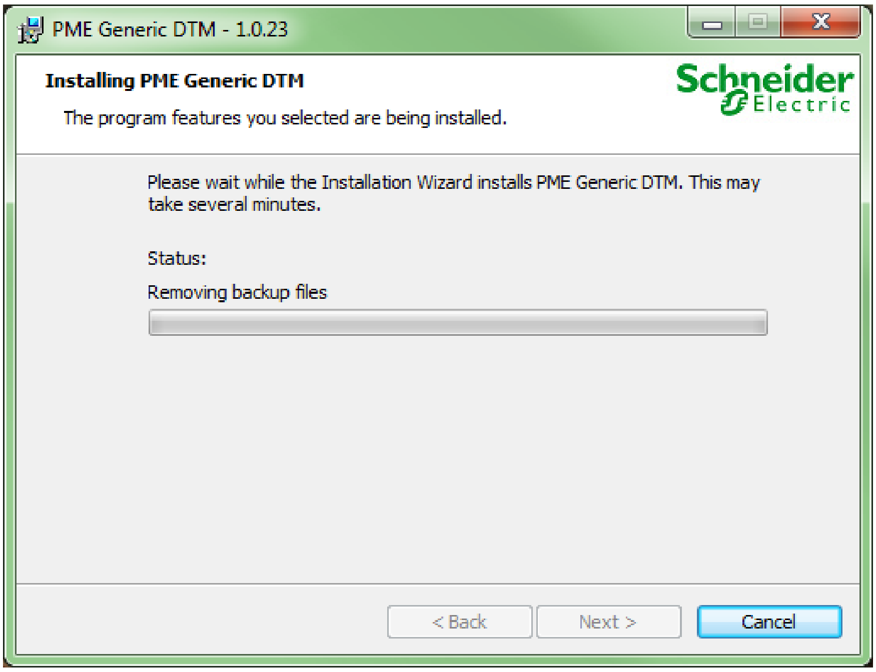


- The uninstallation setup will reconfirm the uninstallation as shown in the image below , as the library is a shared component

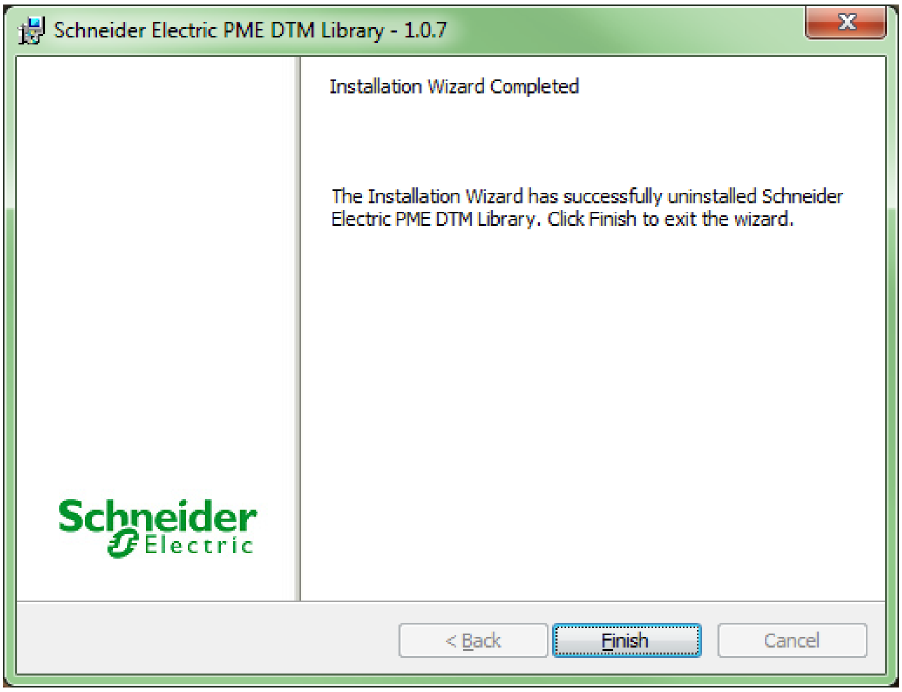


- Click on Yes to proceed with the uninstallation.

The uninstallation wizard moves on to remove the files of the PME DTM Library as shown in the image below.



- After successful removal of the Library click on Finish to exit the setup as shown in the image below.


Schneider Electric PME DTM Library - 1.0.7
Installation Wizard Completed
The Installation Wizard has successfully uninstalled Schneider Electric PME DTM Library. Click Finish to exit the wizard.
< Back
Finish
Cancel

5. Adding a Third-Party Module to a Unity Pro Project

This document shows you how to add a third-party module to a new project created in Unity Pro version 8.0. In this example, the PME SWT 0100 weighing module is added. Before you begin, confirm that Unity Pro version 8.0 is installed on your PC. When Unity Pro version 8.0 or higher is installed on your PC, a DTM library – which includes the DTM for the PME SWT 0100 module – is also installed on your PC.

Note: You will need to install on your PC the Generic PME DTM. You can download this DTM from the Scaime or Schneider Electric website. Refer to the ReadMe file for the Generic PME DTM for instructions on how to install this DTM on your PC.

This document illustrates how to use Unity Pro to:

Create a new Unity Pro project, selecting both a CPU and a rack, and adding a third-party module, in this example the PME SWT 0100 weighing module.

Configure the CPU, including:

- Setting the main CPU IP address and the IP address used by the CPU for IO scanning
- Enable FTP/TFTP transmissions of configuration files between the CPU and your PC
- Optionally enabling port mirroring, to permit the use of a packet sniffer that can analyze Ethernet packets passing over the CPU's Ethernet ports

Add an PME SWT 0100 module DTM to the project design in the Unity Pro DTM Browser.

Configure the IP address for the connection between the CPU and your configuration PC.

Configure address server settings for PME SWT 0100 module.

Configure DTM parameters for the PME SWT 0100 module.

Build the Unity Pro project configuration file, which does not include the third-party module configuration settings, and then transfer the file to the PLC.

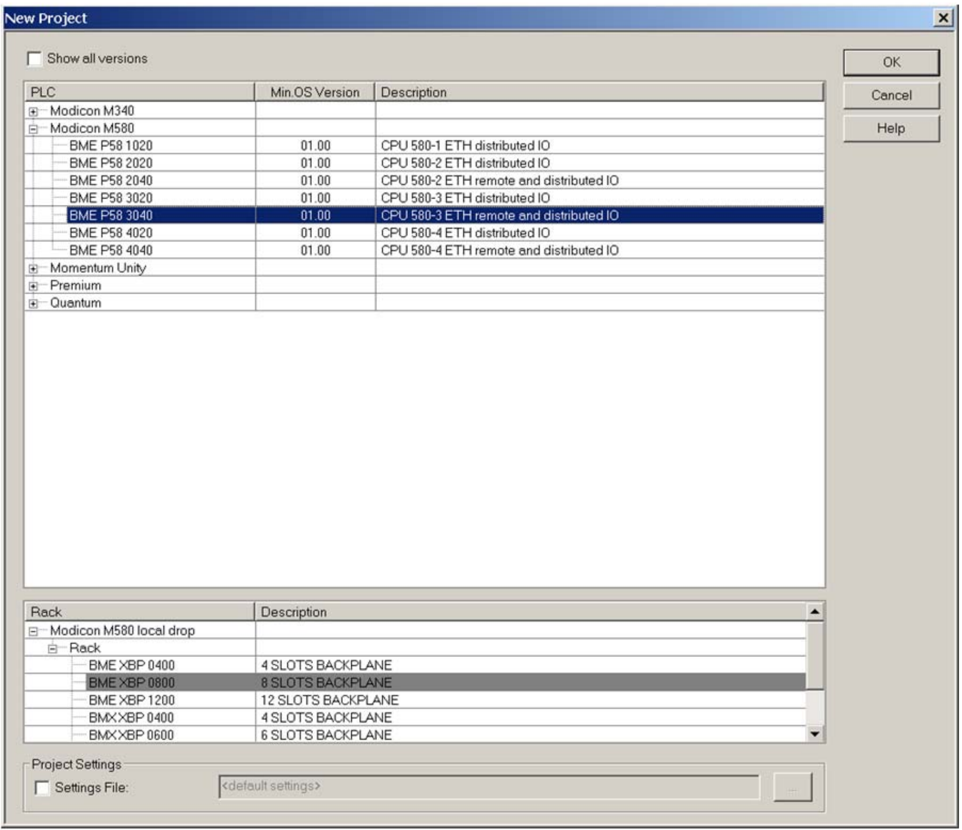
Generate a third-party (PME SWT 0100) module configuration file and then transfer that file to the PLC.

Run the newly created Unity Pro project, and access the calibration page on the PME SWT 0100 module.

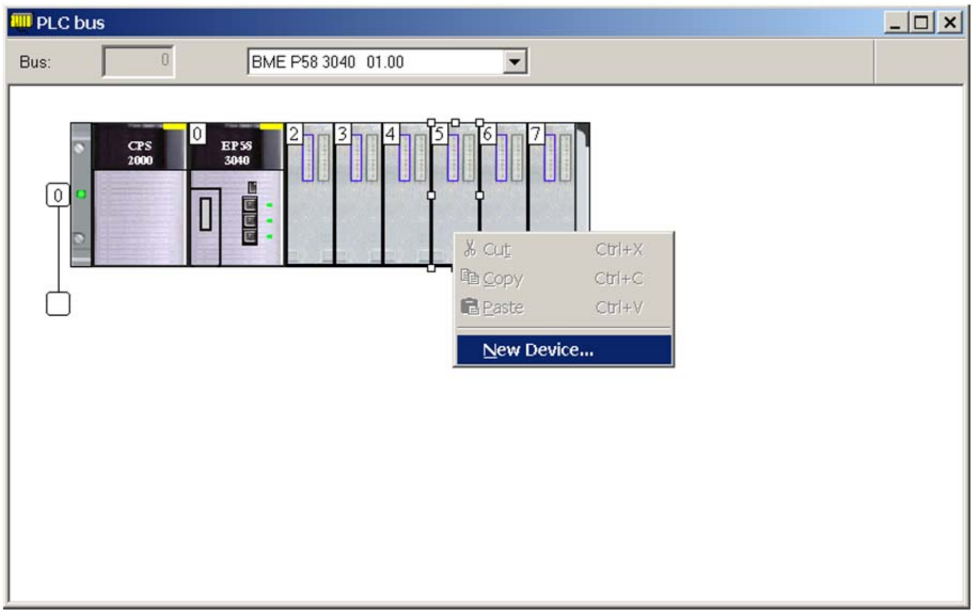
5.1. Create a New Unity Pro Project

Create a new Unity Pro project by selecting both a CPU and a rack, then adding an PME SWT 0100 weighing module.

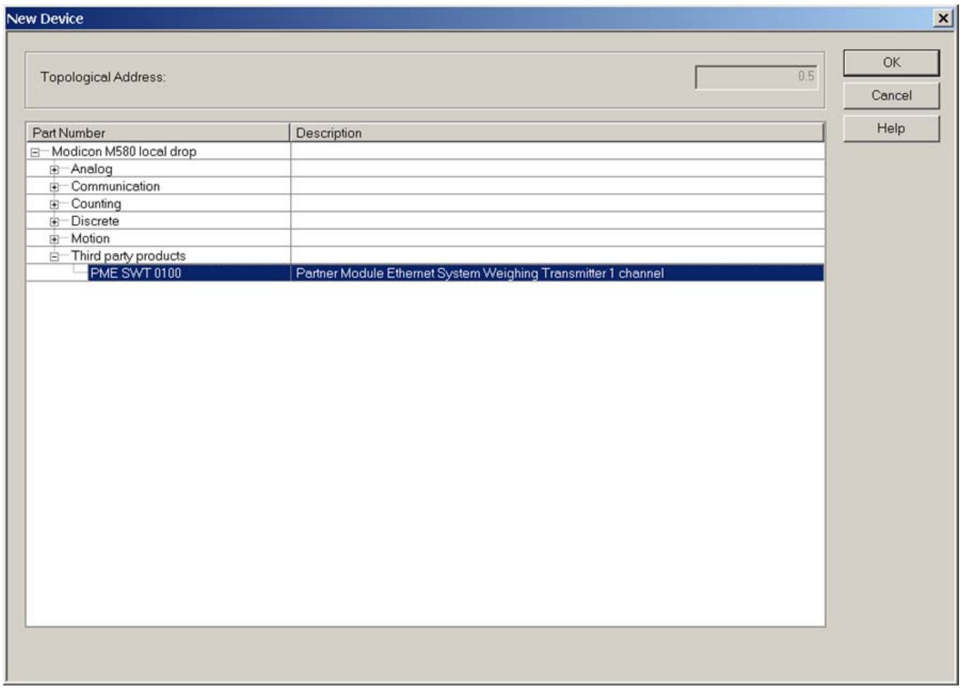
- Open Unity Pro and Select **File -> New Project.**



- In New Project dialog, select an M580 PLC and a rack for the backplane, then click **OK**.
- In the Unity Pro Project Browser, under the Configuration node, double-click on the PLC Bus icon to open the PLC Bus window.
- Place your mouse pointer on an empty slot in the PLC rack, and click the right mouse button to display the following menu:

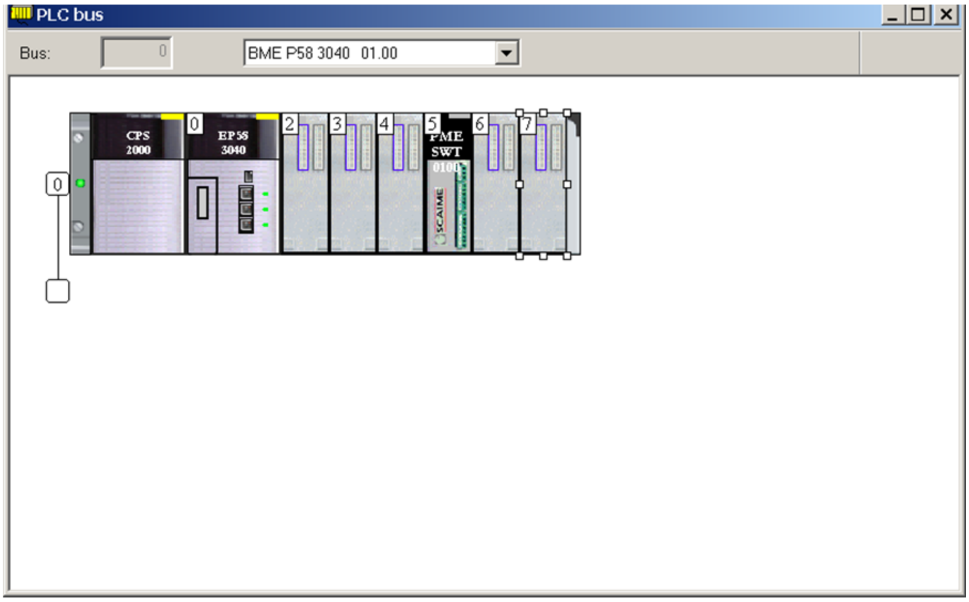


- Select **New Device…** to open the New Device dialog>



- Select the PME SWT 0100 module and click **OK**.

The PME SWT 0100 weighing module is added to the rack in the specified slot:

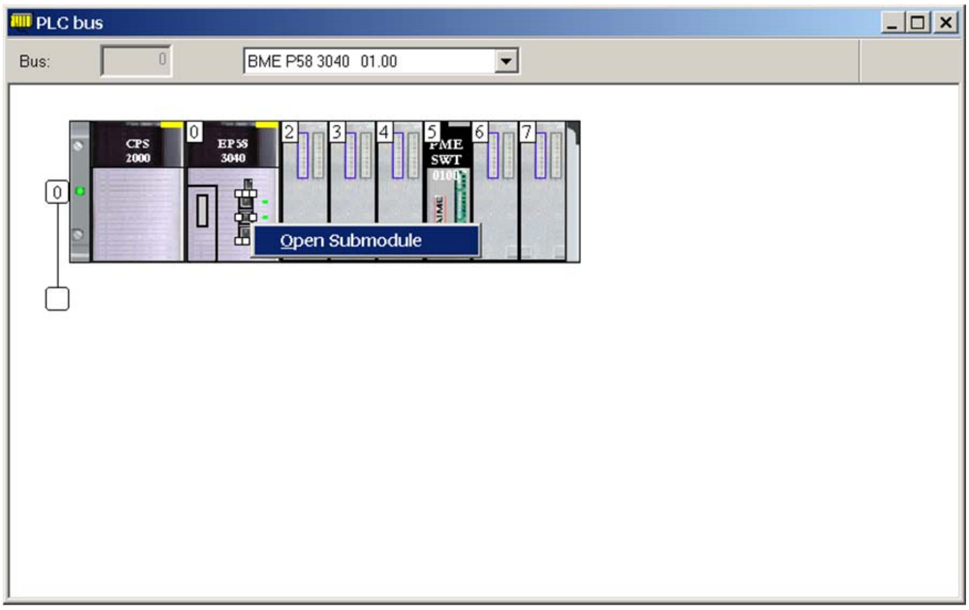


5.2. Configure the CPU

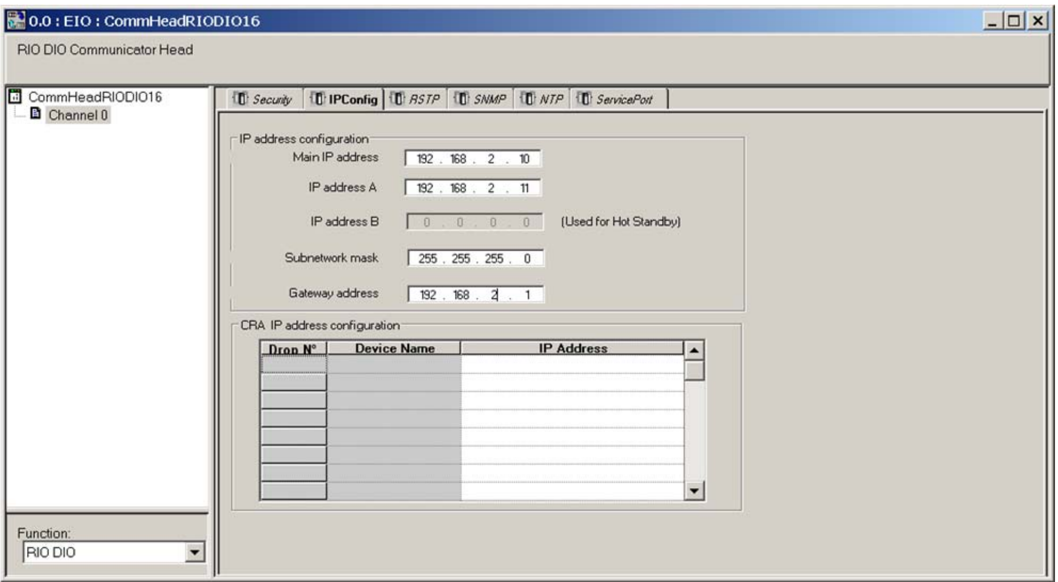
The next task is to configure the CPU by:

- Setting the main CPU IP address and the IP address used by the CPU for I/O scanning
- Enabling FTP/TFTP transmissions of configuration files between the CPU and your PC
- Optionally enabling port mirroring, to permit the use of a packet sniffer that can analyze Ethernet packets passing over the CPU's Ethernet ports

In the PLC Bus window, place your pointer on the Ethernet ports of the CPU, then click the right mouse button to display a context menu:



- Select **Open Submodule** to open a configuration window for RIO DIO Ethernet communications.
- Select the IPConfig tab:

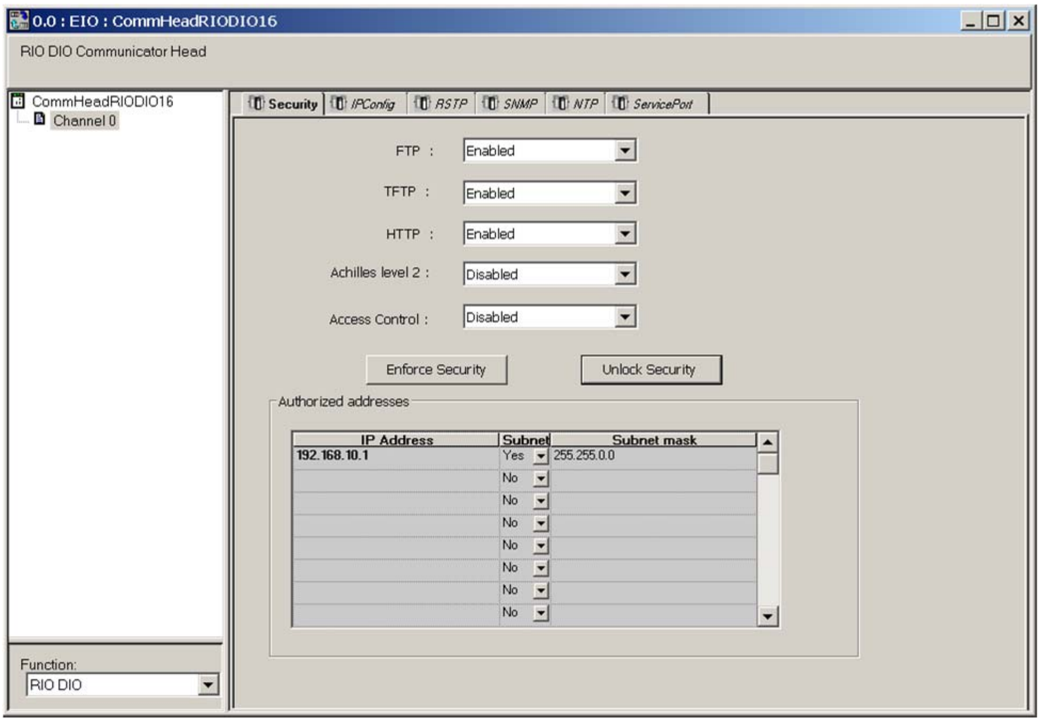


- In the IPConfig page, configure the following parameters:

Parameter	*Setting*
Main IP address:	*Type in the PLC address (in this example: 192.168.2.10)*
IP address A:	*Type in the IP address used by the PLC for I/O scanning (in this example: 192.168.2.11).*

Note: Also enter an appropriate Subnet mask and Gateway address.

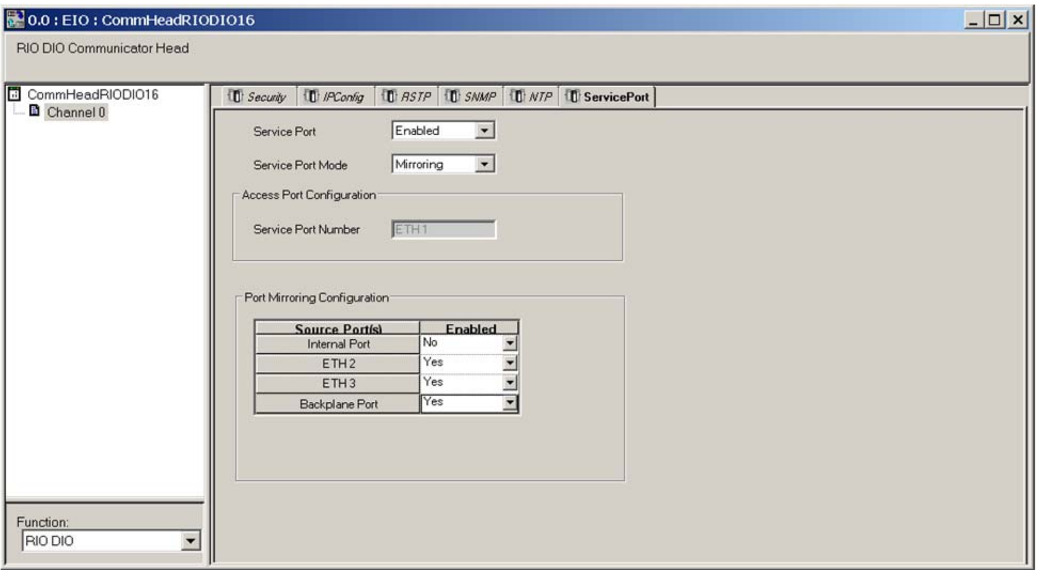
- In the Edit menu (or on the toolbar) click **Validate**, and then save your edits.
- Select the Security tab:



- In the Security page, click the **Unlock Security** button to enable FTP, TFTP and HTTP communication with the PLC (as depicted above).

Note: Enabling FTP and TFTP communications permits the upload and download of parameter configuration files between your PC and the PLC.

- In the Edit menu (or on the toolbar) click **Validate**, and then save your edits.
- Select the ServicePort tab:



Optionally, you can use the ServicePort page to enable port mirroring and use a packet sniffer to analyze Ethernet packets passing over the CPU's Ethernet ports. To configure port mirroring, enter values for the following parameters:

Parameter	*Setting*
Service Port:	*Select **Enabled**.*
Service Port Mode:	*Select **Mirroring**.*
Port Mirroring Configuration:	*Select **Yes** for each port you wish to mirror. In this example, the following ports are mirrored:* • ETH2 and ETH3: external Ethernet ports on the CPU • Backplane port: the Ethernet port connecting the CPU to the Ethernet backplane

Note: When you configure the service port for port mirroring, you cannot also connect your PC to the service port for the purpose of configuring the CPU.

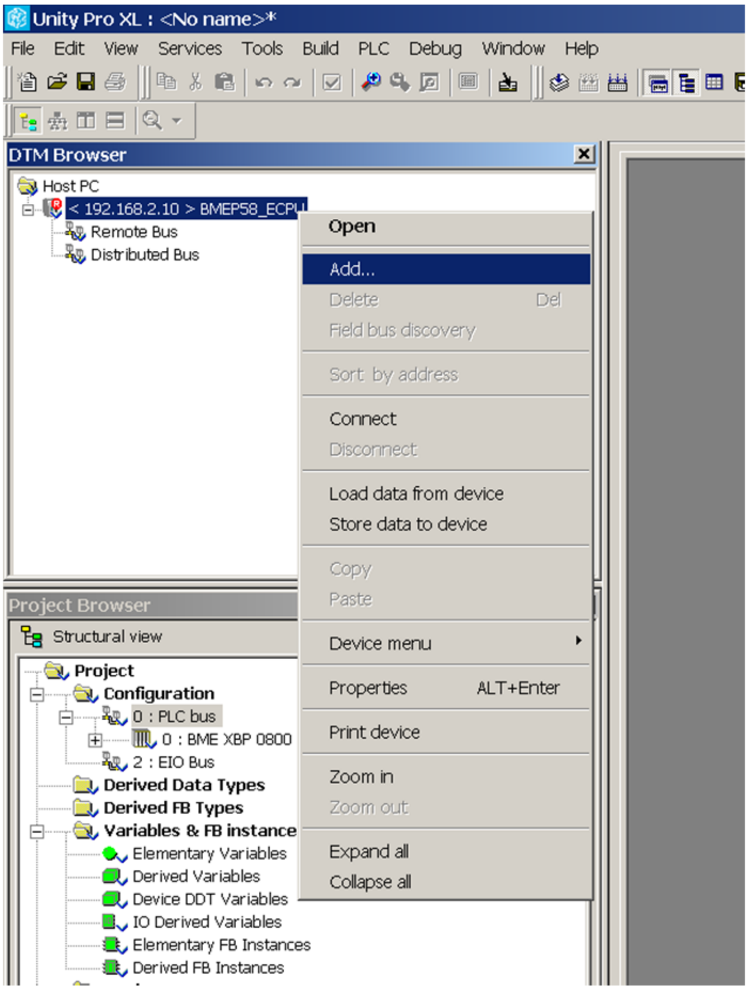
- In the Edit menu (or on the toolbar) click **Validate**, and then save your edits

5.3. Add a Third-Party Module DTM to the DTM Browser

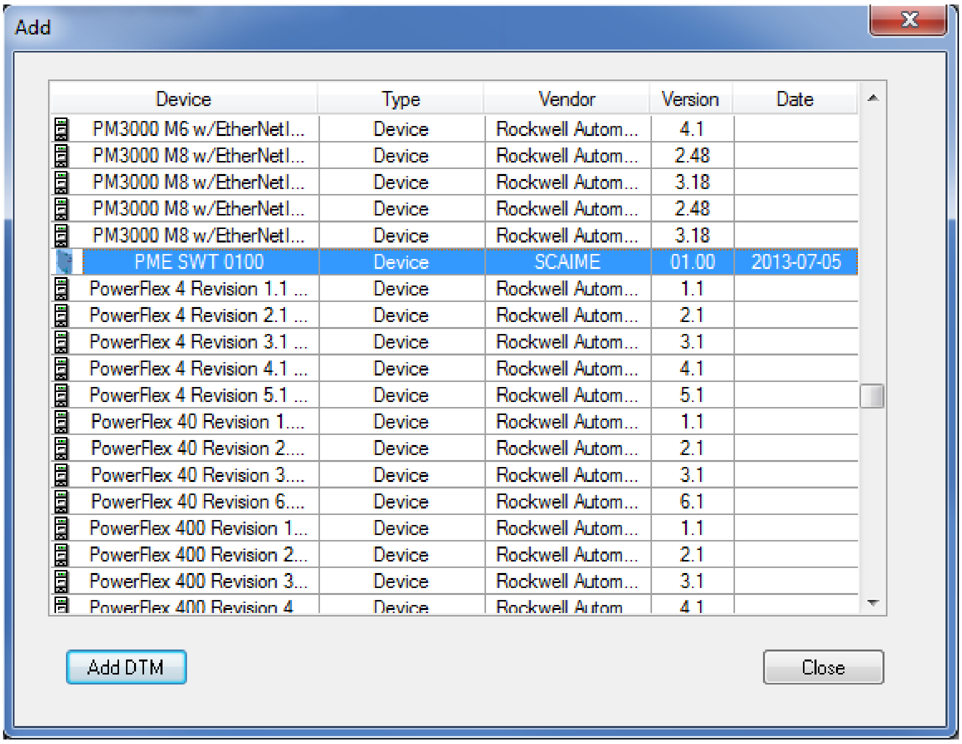
The next task is to add the DTM for the third-party module (here for the PME SWT 0100 module) to the Unity Pro DTM Browser.

Note: In Unity Pro version 8.0, you need to add a third-party module separately to both the PLC Bus and to the DTM Browser. In future versions of the software, adding the module to the PLC Bus will also add its DTM to the DTM Browser.

- Open the DTM Browser by selecting **Tools -> DTM Browser**.
- In the DTM Browser, select the CPU and click the right mouse button to open a context menu:

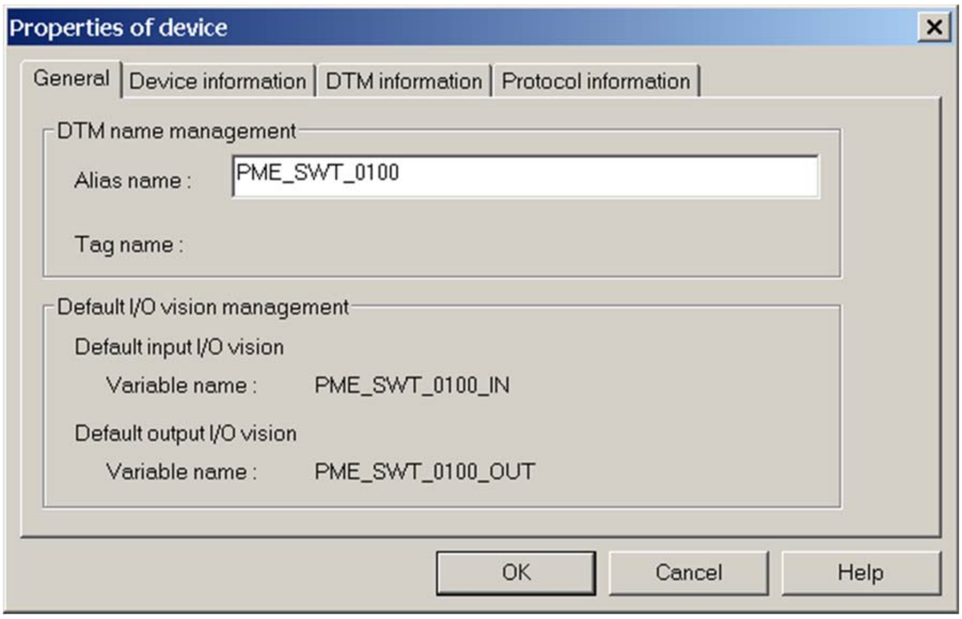


- Click **Add** to open the Add dialog:



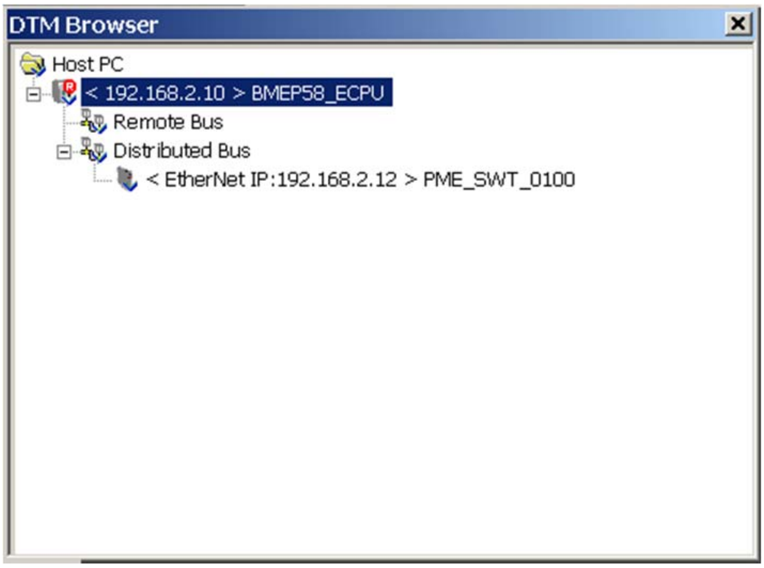
Note: If the desired third-party module does not appear in the list, close the dialog, and click **Update** in the DTM Catalog tab of the Unity Pro Hardware Catalog. Then return to the Add dialog.

- In the Add dialog, scroll to and select the DTM for the PME SWT 0100 module, and then click **Add DTM**. A device properties dialog opens, where you can edit the alias name of the module:



- Click **OK**.

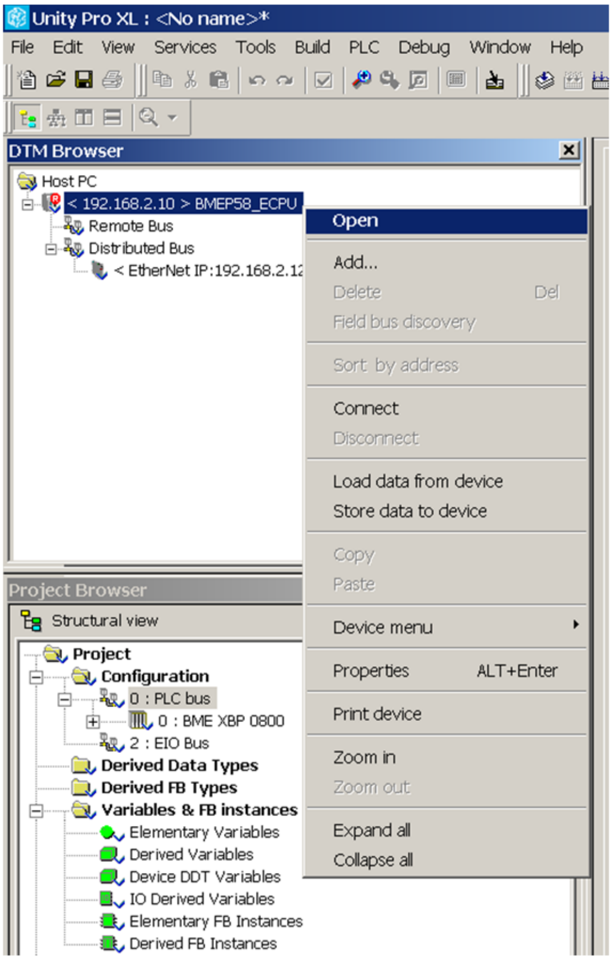
The selected device DTM is added to the DTM Browser:


DTM Browser
Host PC
< 192.168.2.10 > BMEP58_ECPU
Remote Bus
Distributed Bus
< EtherNet IP:192.168.2.12 > PME_SWT_0100

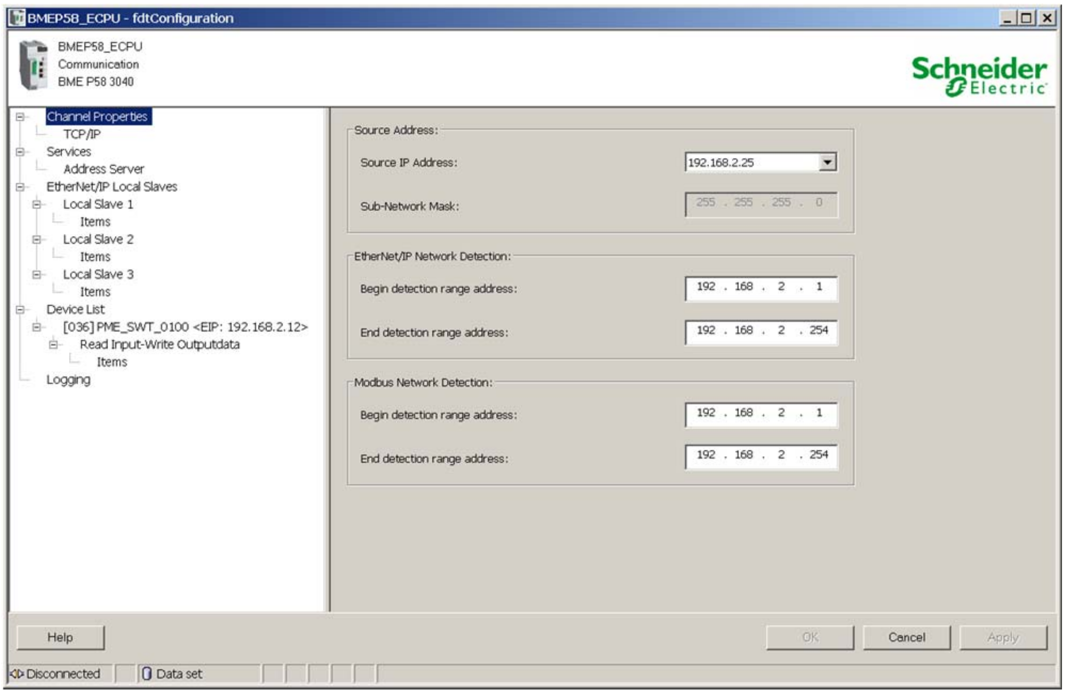
5.4. Input the Source IP Address for the CPU

The next task is to input into the CPU configuration a Source IP Address for the Unity Pro project. The Source IP Address is an IP address for a network interface card installed on your configuration PC. Unity Pro uses this address to connect to the CPU and transmit or receive project configuration settings.

- In the DTM Browser, select the CPU and click the right mouse button to open the following context menu:



- Click **Open**. The master DTM properties window opens.
- In the master DTM navigation tree, select Channel Properties to display the following page:



- Input the Source IP Address. In this example, Unity Pro communicates with the CPU at the address 192.168.2.25.

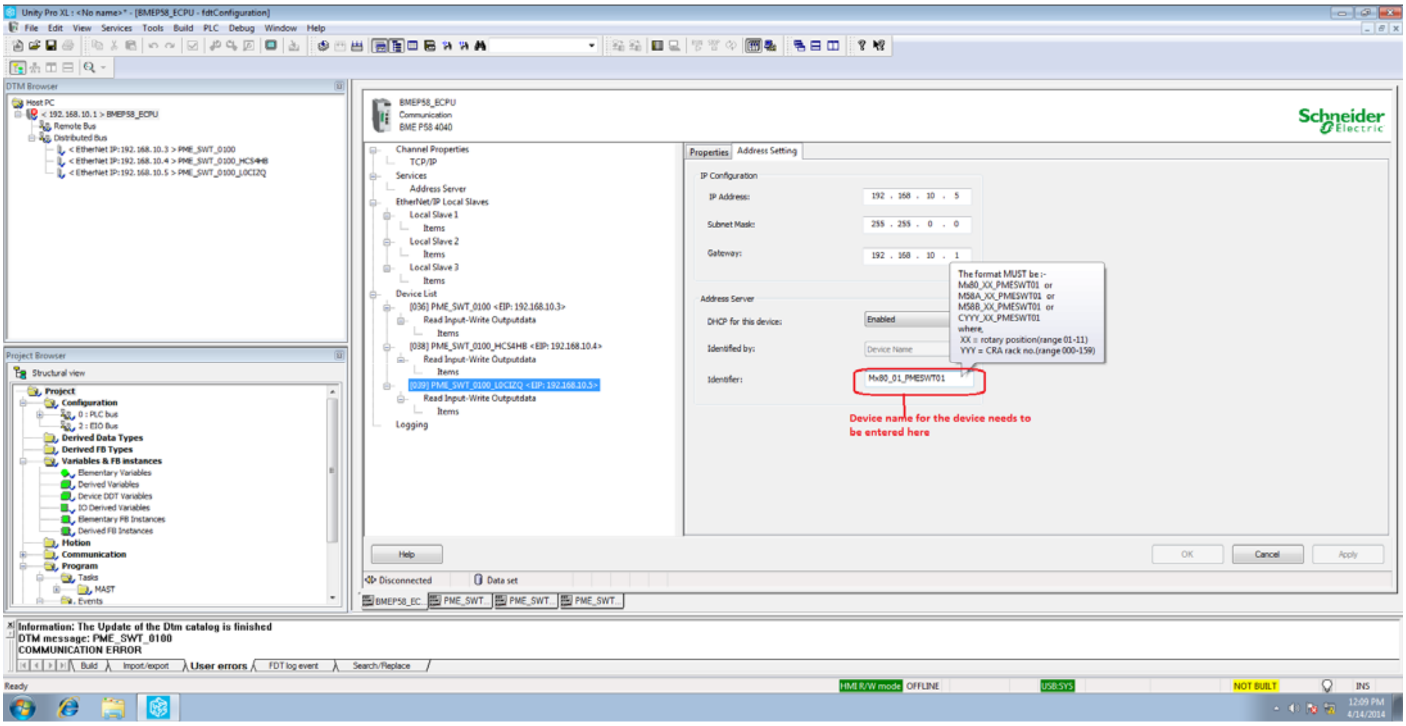
Note: You can also use the settings on this page to configure auto-detection of devices on both the EtherNet/IP and Modbus networks.

- Click **Apply** to save your edits, and leave the window open for additional edits.

5.5. Configure IP Address and DHCP for the Third-Party Module

The next task is to configure the IP address for the third-party module, and identify the module as a DHCP client of the DHCP server that resides in the CPU. This process will add the third-party module to a list of modules, which will be served IP address settings and configuration parameter settings by the DHCP server located on the M580 PLC.

- In the master DTM navigation tree, select the third-party module (in this case the PME SWT 0100 module):



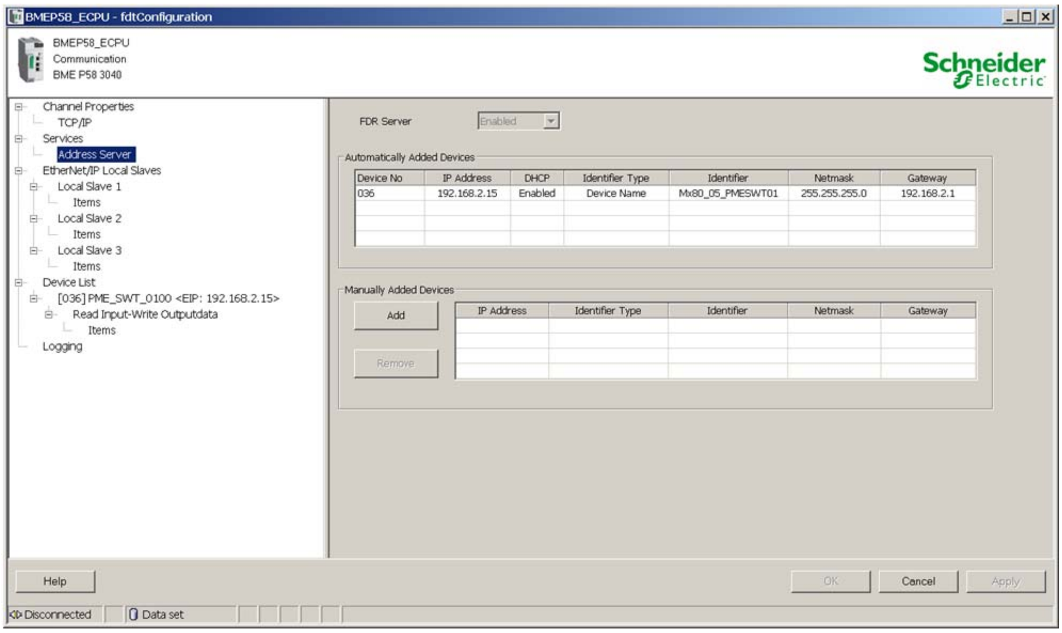
- Click on the Address Setting tab to open that page, then configure the following properties:

Parameter	Setting
IP Address:	*Type in the IP address to be assigned to the third-party module (in this example: 192.168.2.15).*
DHCP for this device:	*Select **Enabled** to identify the third-party module as a DHCP client.*
Identified by:	*Select Device Name.* ***Note**: Only the Device Name selection is supported for third-party modules. Do not select the MAC Address option.*
Identifier:	*Type in a concatenated string consisting of the following components separated by the underscore character (_):* • rack name (4 characters) • slot number (2 characters) • module name (8 characters) • In this example, the Identifier setting is: • Mx80_05_PMESWT01

Note: Also complete the Subnet Mask and Gateway settings, as necessary.

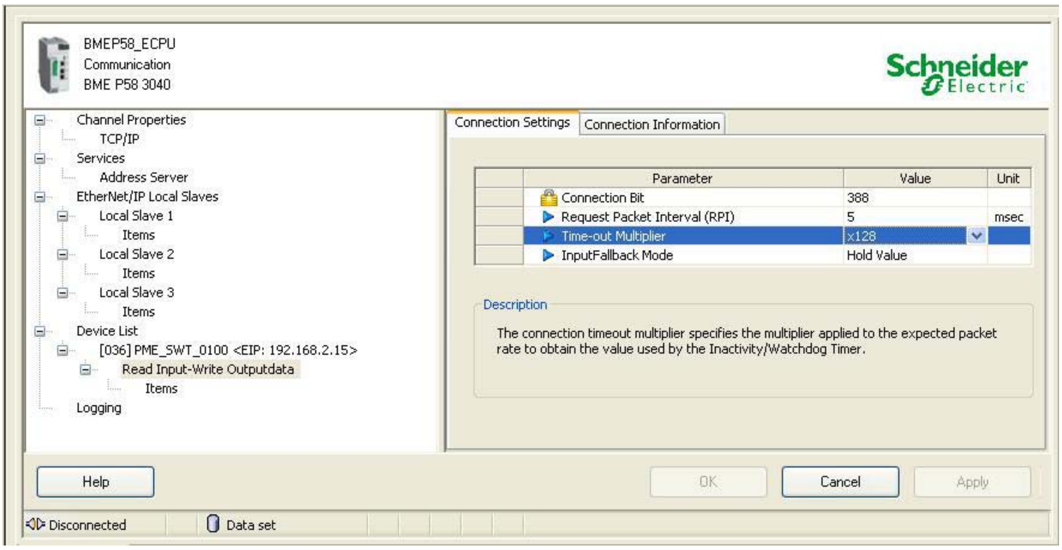
- Click **Apply** to save your edits, and leave the window open.

To verify that the module is added to the list of devices to be served by the DHCP server, in the master DTM, navigate to and select the Address Server page. There you can see that the third-party module appears in the list of modules to receive IP address and DTM parameter settings from the DHCP server:



The next step is to set the connection time-out multiplier value for the I/O connection from CPU to the third-party module.

- In the master DTM navigation tree, click on the following node:
  Device List -> <third-party module> -> Read Input-Write Output data.
- Click on the Connection Settings tab:

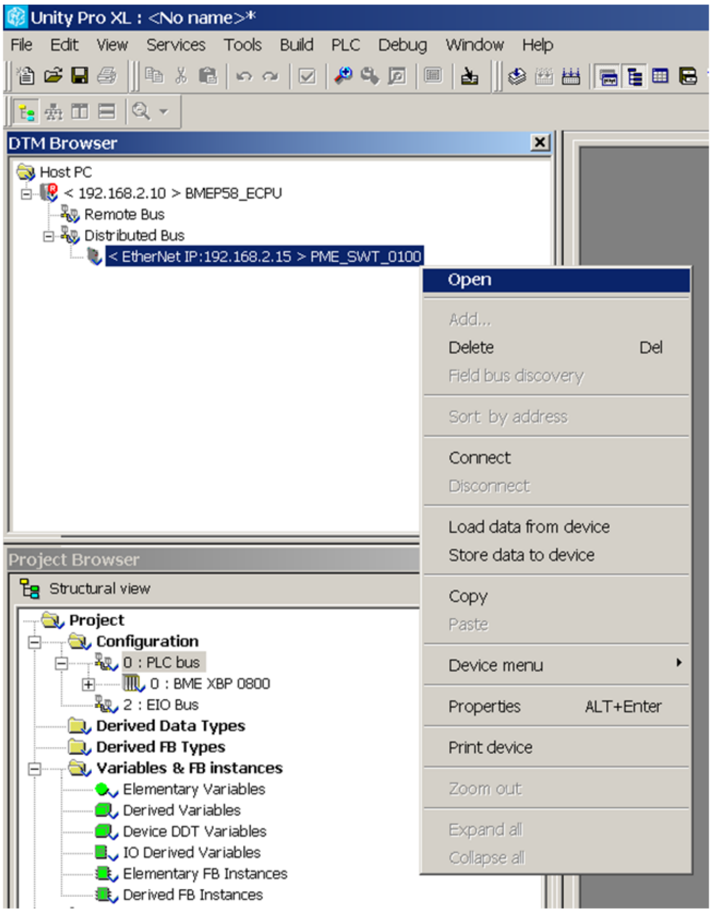


- Set the Time-out Multiplier setting to **x128**, then click **Apply**.

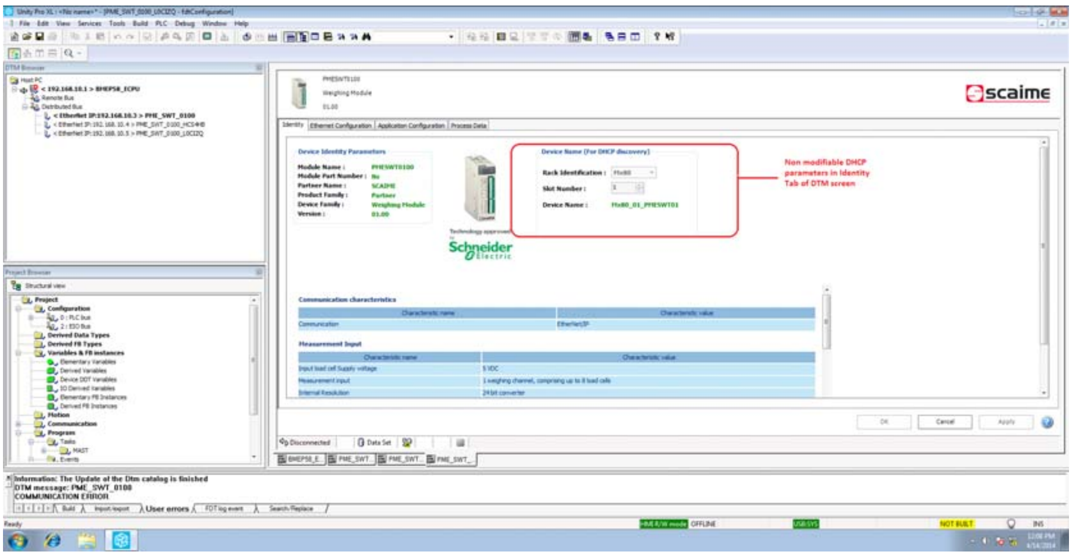
5.6. Configure the Third-Party Module's DTM Parameters

After the third-party module DTM is added to the DTM Browser, you can configure parameters that are unique to that module, in this case the Scaime PME SWT 0100 weighing module. Although the module DTM presents many configurable parameters, this example focuses only on those parameters that are minimally necessary for module operation.

- In the DTM Browser, select the third-party module and click the right mouse button to display the following context menu:



- Select **Open**. The third-party module's DTM configuration window opens:



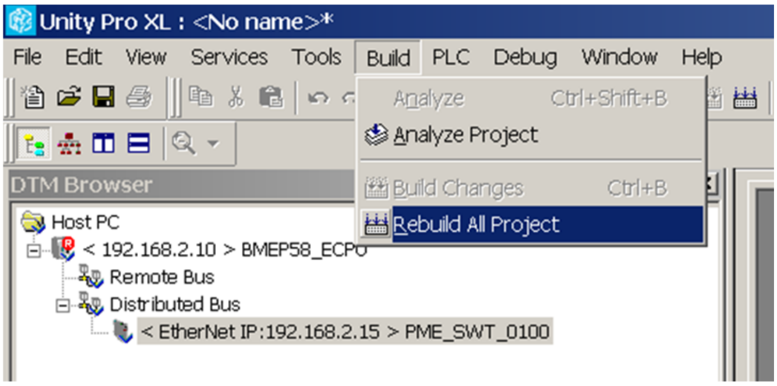
- Optionally, you can click on other tabs to access and configure parameters in those pages.
- When you finish editing parameter settings, click **Apply** to save your edits.

5.7. Build a Unity Pro Project File and Transfer it to the PLC

In this task you will build a file that contains the Unity Pro project configuration settings and transfer that file to the PLC.

Note: The project file you create in this task does not include the DTM configuration settings for the Scaime PME SWT 0100 third-party module. Those settings will be separately generated and transferred to the PLC.

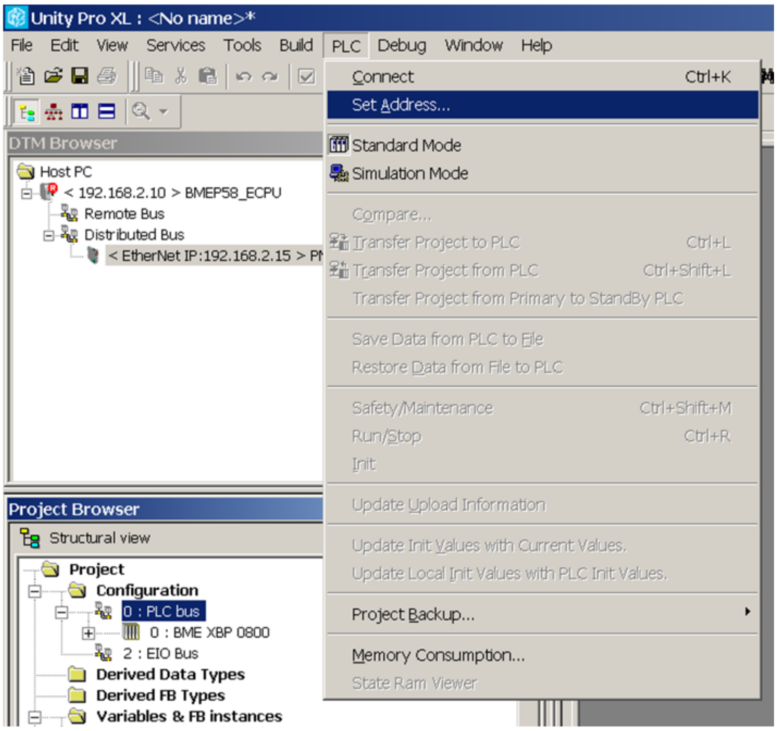
- To build the project, select **Build -> Build All Project**.



Upon completion of the process, the task bar will display the word “Built”.

The next task is to set the address of the PLC for transfer of the newly built project.

- Select PLC -> Set address…

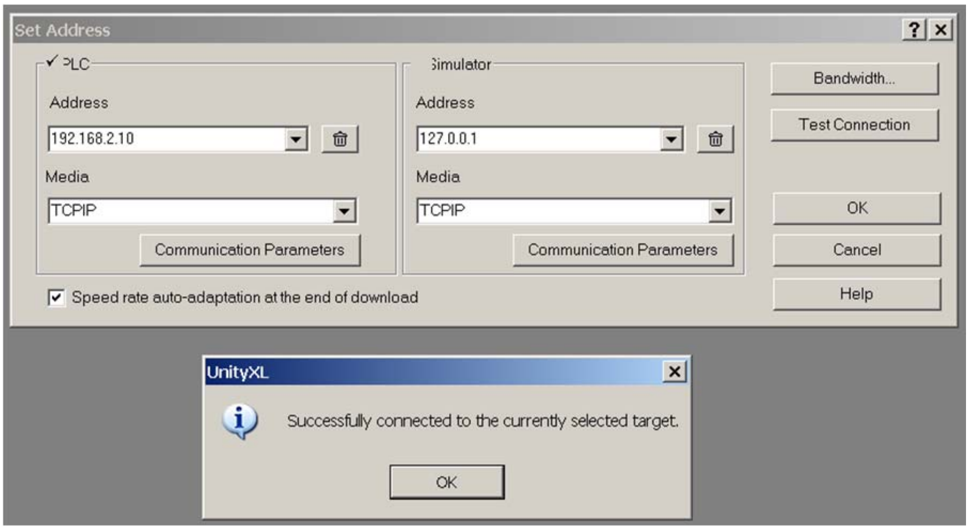


The Set Address dialog opens (see below).

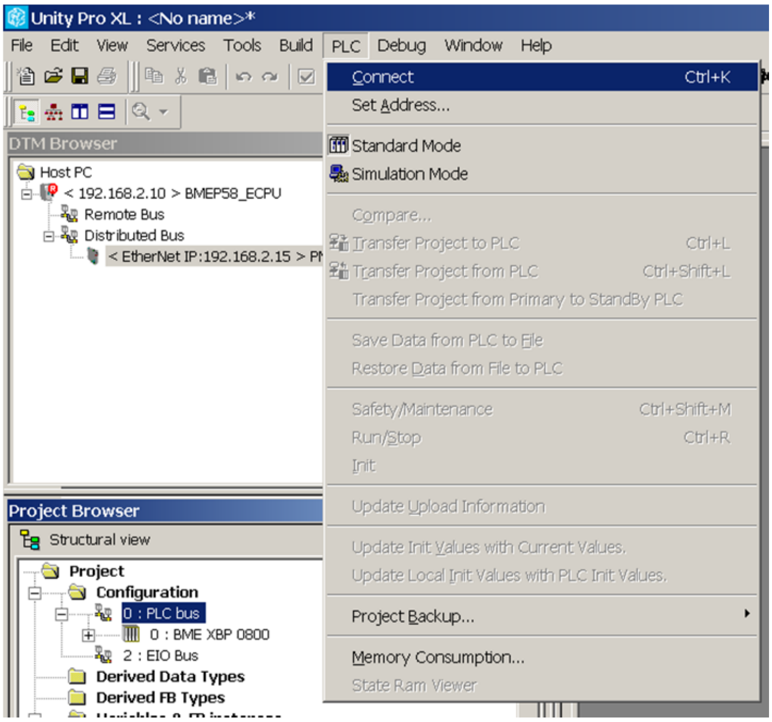
In the Set Address dialog:

- Select the the PLC’s IP address from the drop down list (in this example, the address is 192.168.2.10)
- select **TCPIP** as the Media
- click **Test Connection**

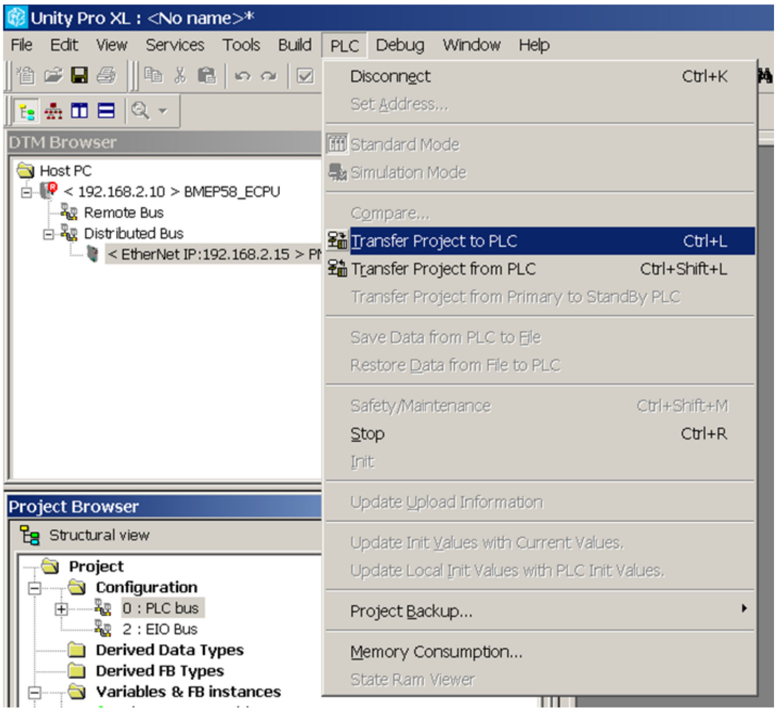
Unity Pro indicates if the test is successful:



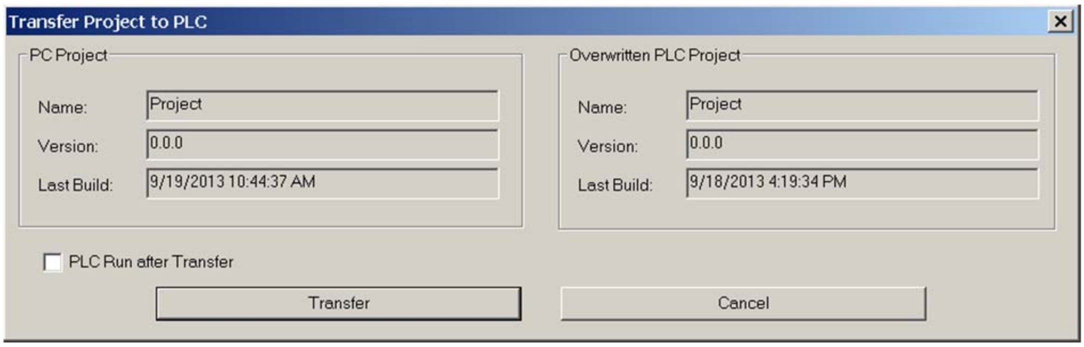
- Click **OK** to close the message box.
- The next task is to connect Unity Pro to the PLC. Select **PLC -> Connect**:



- Select PLC -> Transfer Project to PLC:



The Transfer Project to PLC dialog opens:



- Click **Transfer**. This task completes the transfer of the project file to the PLC, but without the DTM settings for the third-party module.

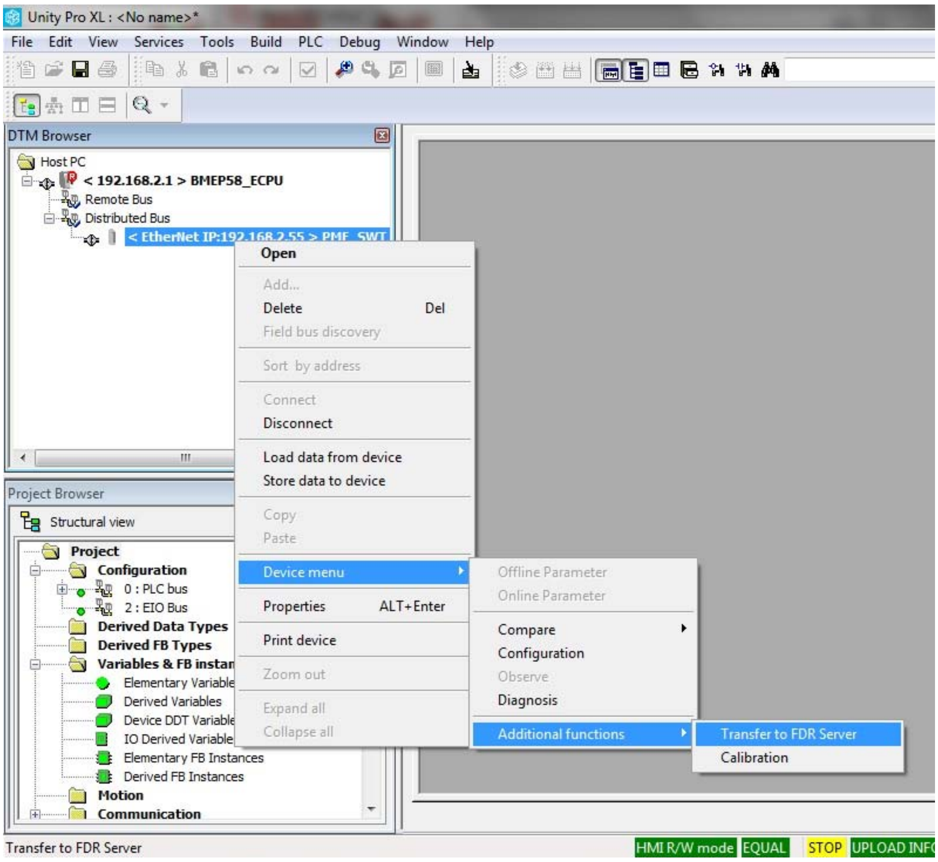
5.8. Transfer a Third-Party Module Configuration File to the PLC

The next task is to transfer the configuration file to the PLC.

- If the project is running, stop the project by selecting **PLC -> Stop**. If you are asked to confirm stopping the project, click **OK**.

Unity Pro generates a configuration file for the third-party device configuration.

- In the DTM Browser, select the third-party module DTM, click the right mouse button, and then navigate to and select: **Device menu -> Additional functions -> Transfer to FDR Server**:



Unity Pro indicates the transfer was successful

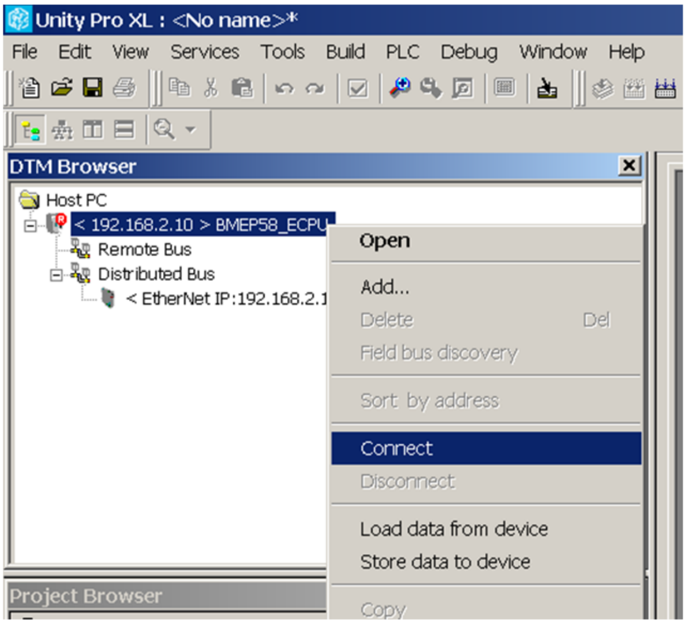
5.9. Run the New Project

The last task is to operate the newly created project. To complete this task, you will need to connect Unity Pro to the CPU DTM and to the third-party module DTM.

Note: The order in which you connect Unity Pro to each DTM is important. First connect Unity Pro to the CPU DTM. Only after this connection is made should you make the connection between Unity Pro and the third-party module DTM.

For the PME SWT 0100 weighing module, you will also want to perform calibration on the module before running the application for the first time. Calibration can be performed only in online mode, after the module has successfully acquired IP address and parameter configuration settings from the FDR server, and is operating normally.

- To start the project, select **PLC -> Run**. If you are prompted to confirm the run command for this project, select **OK**.
- With the project now running, in the DTM Browser select the CPU DTM and then click the right mouse button. The following context menu displays:

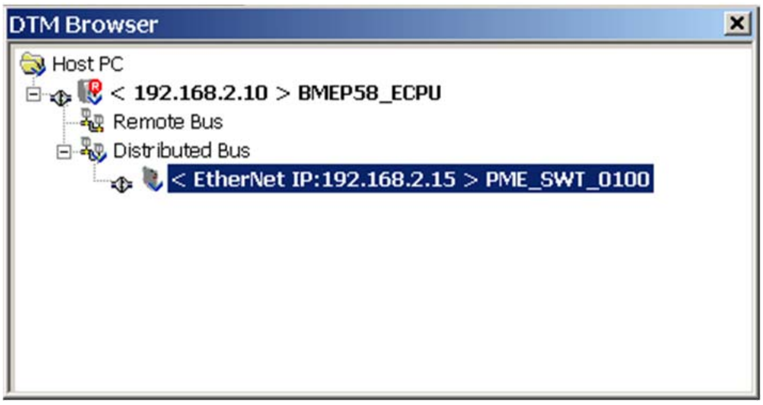


- Select **Connect**, to connect Unity Pro to the CPU DTM.

Note: When connected, the IP address and device name appear in **bold** letters.

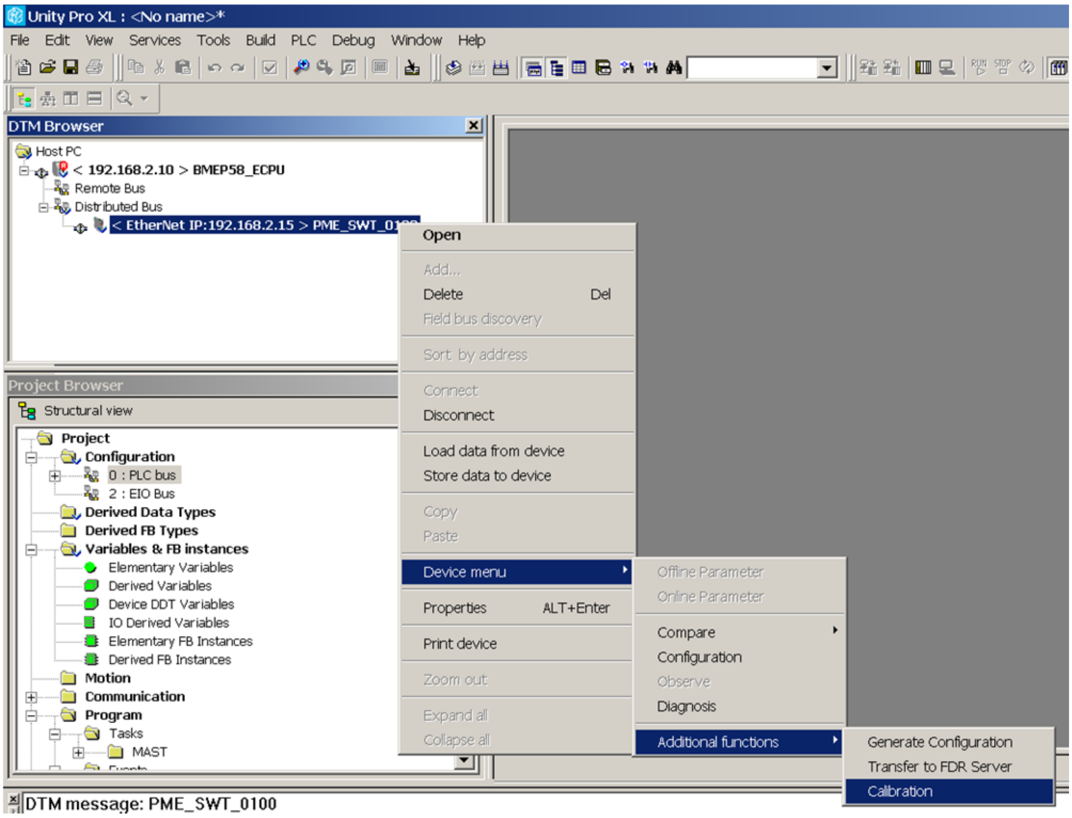
The next task is to connect Unity Pro to the DTM for the third-party module (in this example, the Scaime PME SWT 0100 weighing module).

- In the DTM Browser select the third-party module DTM, and then click the right mouse button. The same context menu appears.
- Click **Connect**, to connect Unity Pro to the third-party module DTM. Now, the IP address and name of each module appears in bold lettering, indicating both devices are connected.

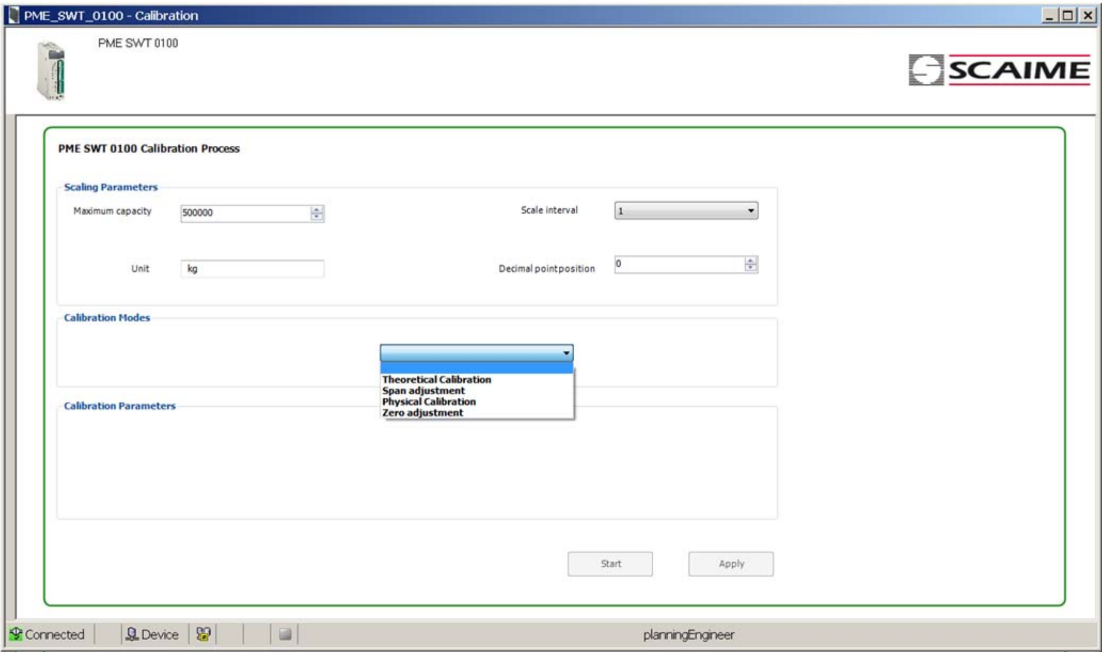


Now that Unity Pro is connected to both DTMs, you can proceed to calibrate the Scaime PME SWT 0100 weighing module.

- In the DTM Browser, select the third-party module DTM, click the right mouse button, and then navigate to and select: **Device menu -> Additional functions -> Calibration**:



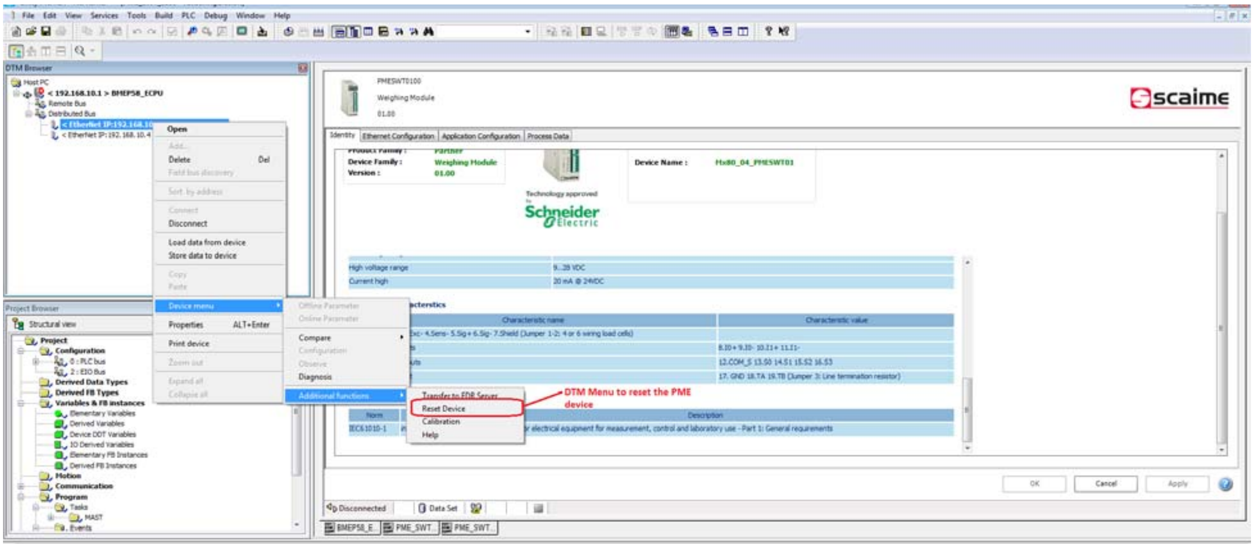
- The Calibration screen opens, where you can perform calibration for the PME SWT 0100 weighing module:



- When calibration is complete, click **Apply**.

5.10. Resetting Device with Unity

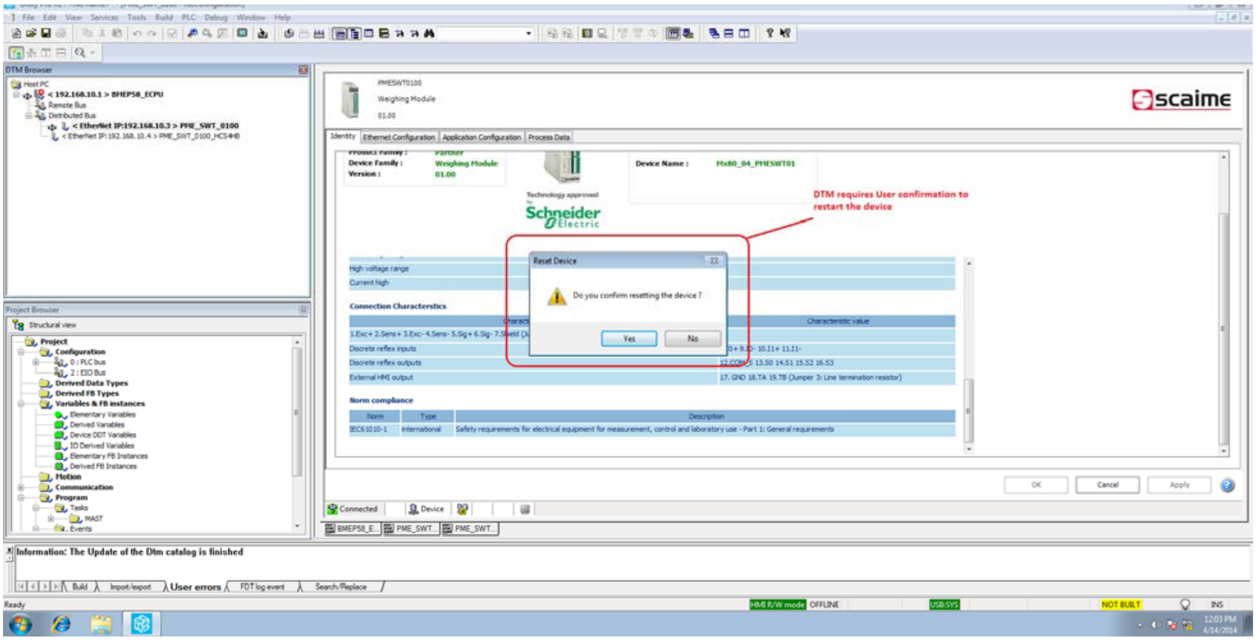
PME SWT DTM provides a menu option to reset the device. The reset of device is helpful in the cases where change in configuration of the device requires restart of the module. The reset functionality is provided as a DTM menu as shown below.



To select the Reset functionality, user needs to right click the device DTM from DTM browse and select *Device Menu -> Additional Function -> Reset Device*

Please note that Reset Device menu is enabled only if the device is in online mode, otherwise it will be disabled.

On selecting the menu item Reset Device, user will be shown a confirmation dialog box with the text “Do you confirm resetting the device?”. If user presses “Yes”, then the Reset command will be sent to the device and the device will restart.



While the device restarts, the DTM will still be in connected mode. The DTM will wait for 1 minute for the device to be functional again. If the device does not become functional within 1 minute, the DTM will display “Communication Error” message.

While the device is restarting, if user again selects the Reset Device DTM menu, an information pop up will be displayed saying “Device reset is already in progress...” as shown below.

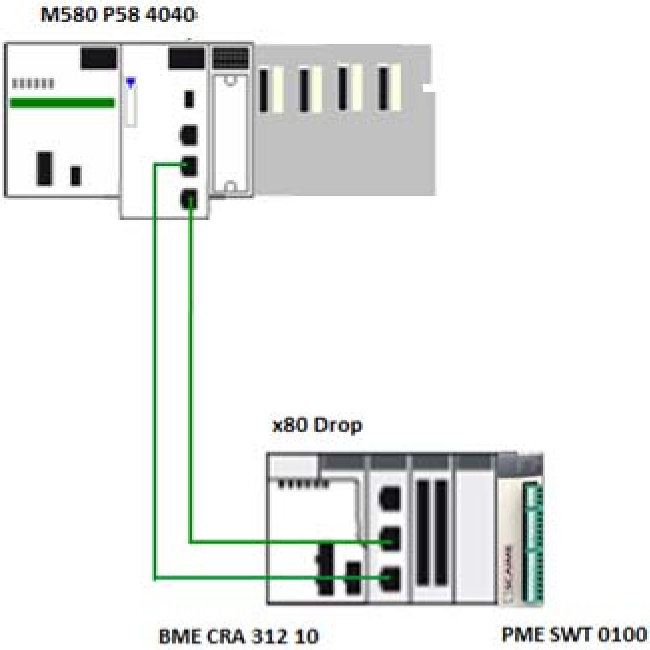
6. Remote rack configuration of PME SWT module

This chapter describes step by step procedure to configure PME SWT device on remote rack in M580 system. There are three major steps to configure the PME device on remote rack.

- Remote rack physical configuration with PME modules
- Device configuration on remote rack in Unity Pro
- Configuration transfer to device

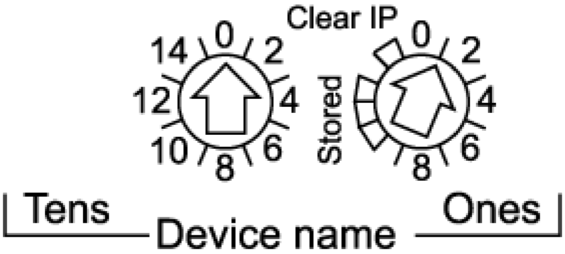
6.1. Remote rack physical configuration with PME modules

The following diagram shows the complete setup of Remote rack along with connection with the M580 CPU.



Note: Firmware version for the remote backplane must be 1.0 or greater.

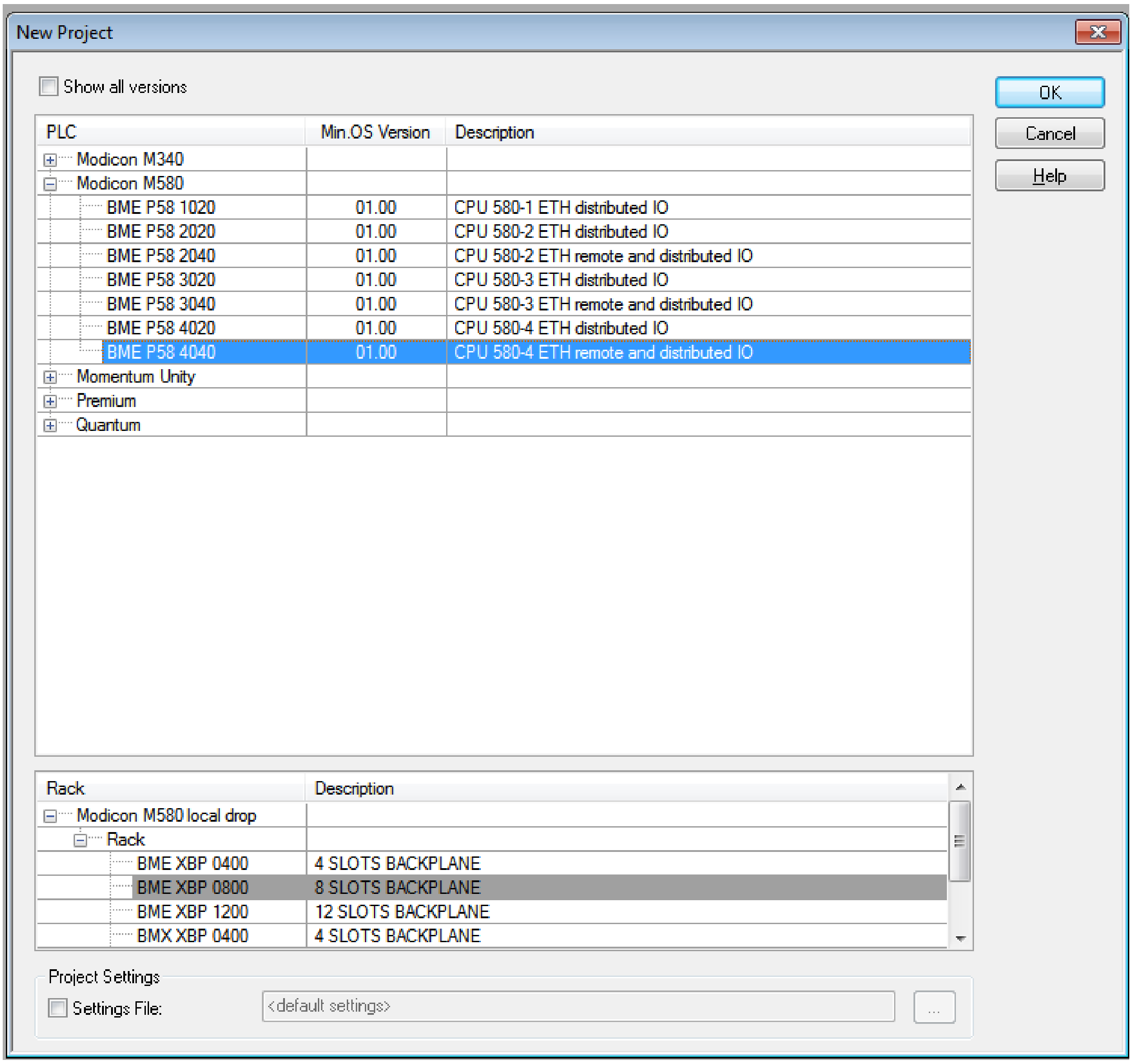
Configure drop number of the CRA using rotary switches as shown below:



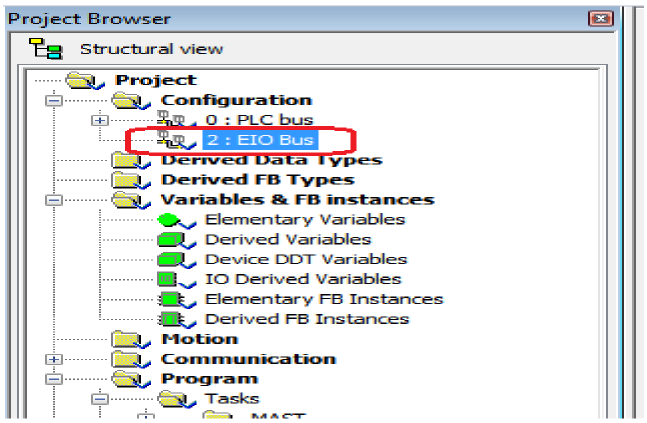
For example if the drop number for the remote rack is 01, then the 10s digit should be 0 and 1s digit should be 1.

6.2. Device configuration on remote rack in Unity Pro:

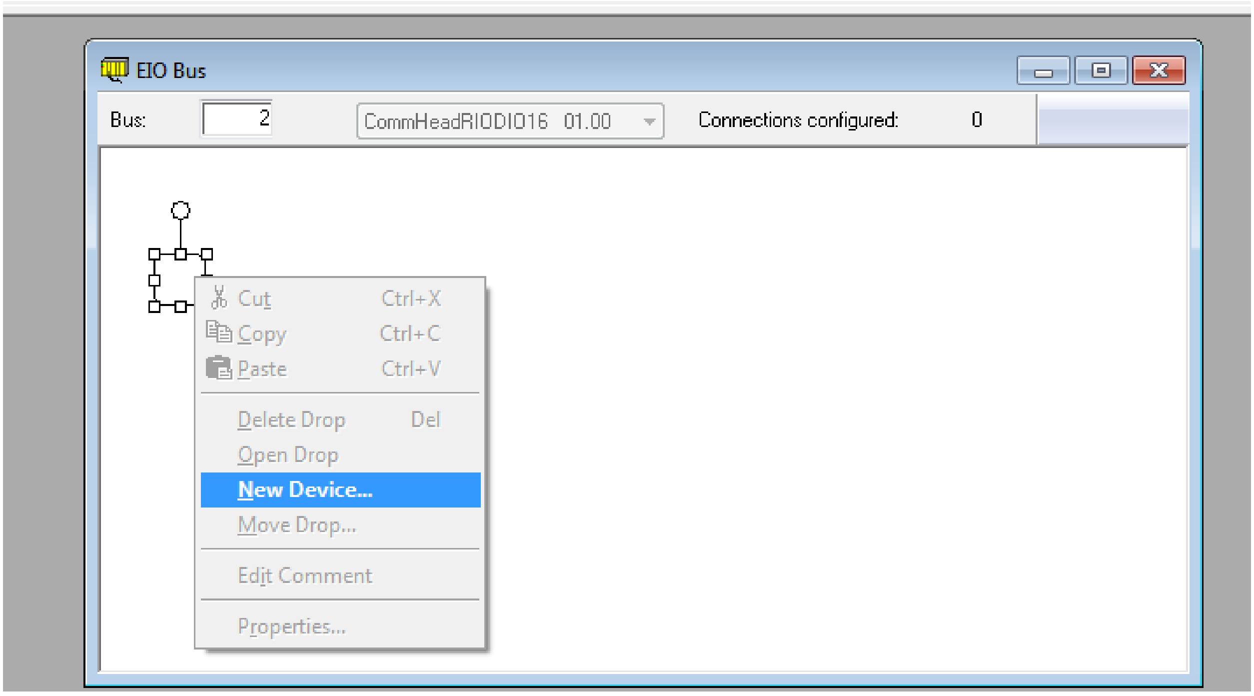
Create new Unity project by selecting M580 CPU which supports RIO bus. The M580 CPUs which support RIO bus are: BME P58 2040, BME P58 3040 and BME P58 4040.



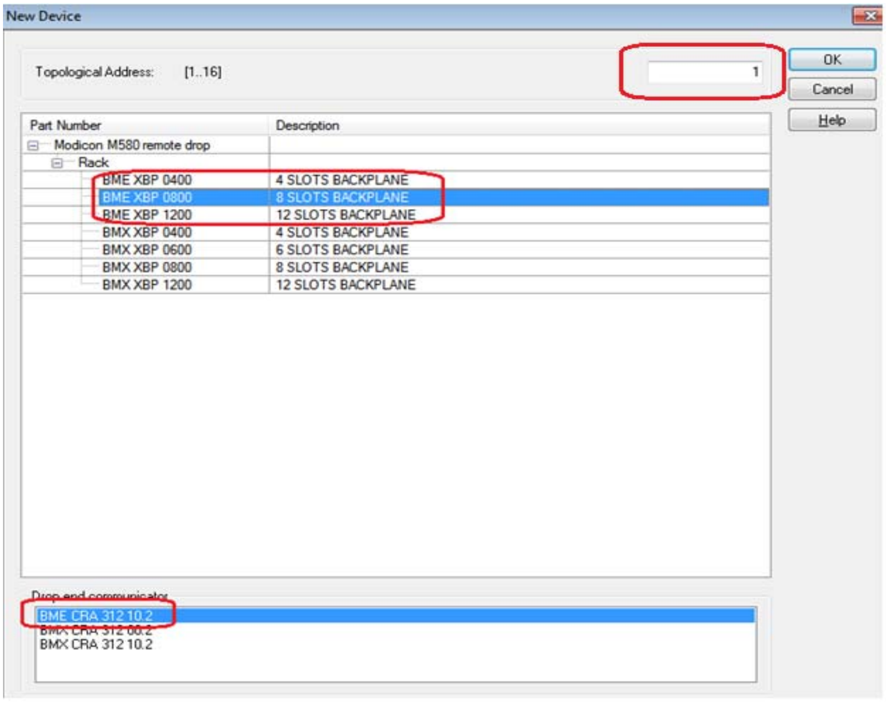
Go to Project Browser of the Unity Pro and double click EIO Bus (*Project Browser->Configuration->EIO bus*) tag as shown below:



In the EIO bus screen, select new device by right clicking on the selected part as shown below

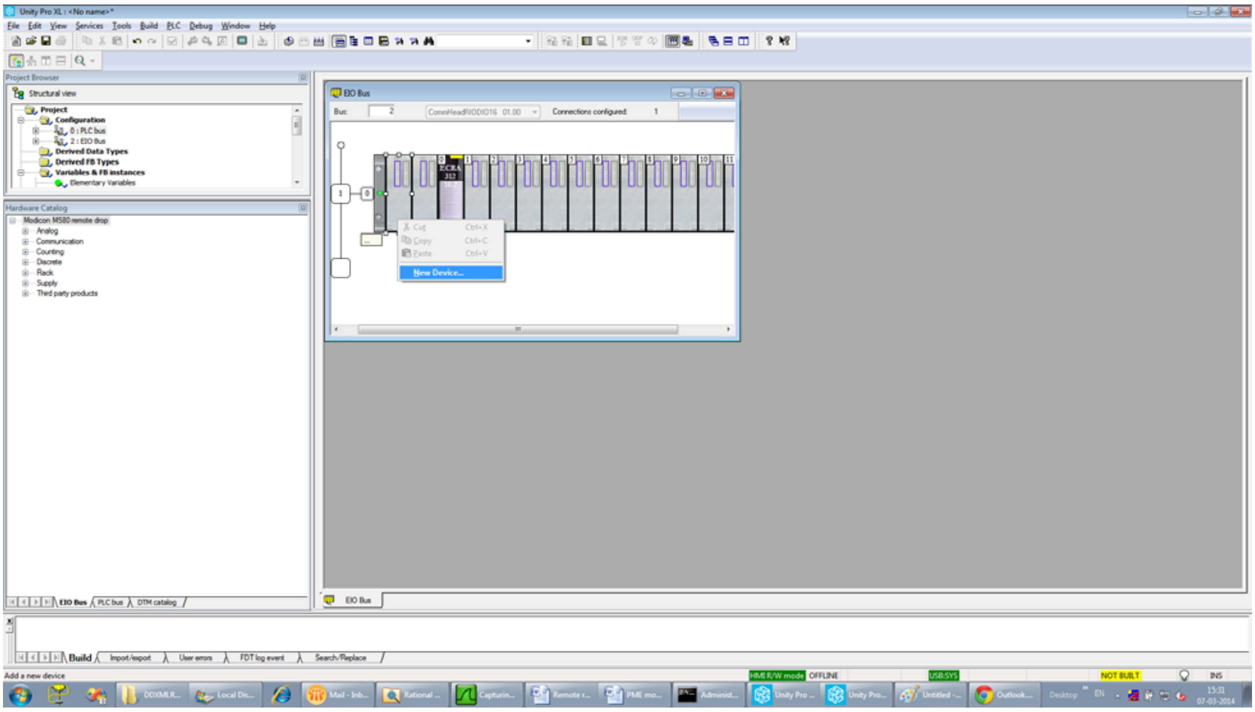


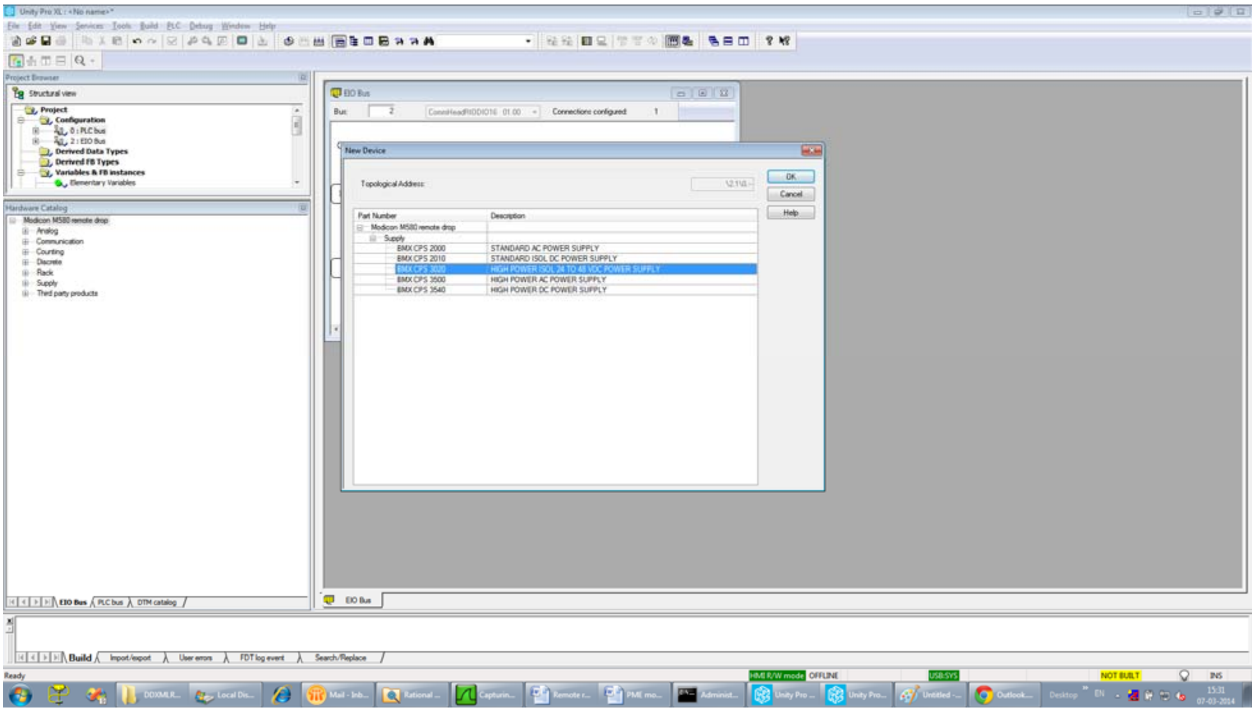
Select appropriate rack for M580 remote drop from New Device popup menu. The rack, selected, should be from BME family and not from BMX family. Therefore user can select any of the first three BME racks available. Also provide topological address for the drop from 1-16. The topological address, set by user, should be the same as it is physically configured in the CRA device (refer to section 1.1).



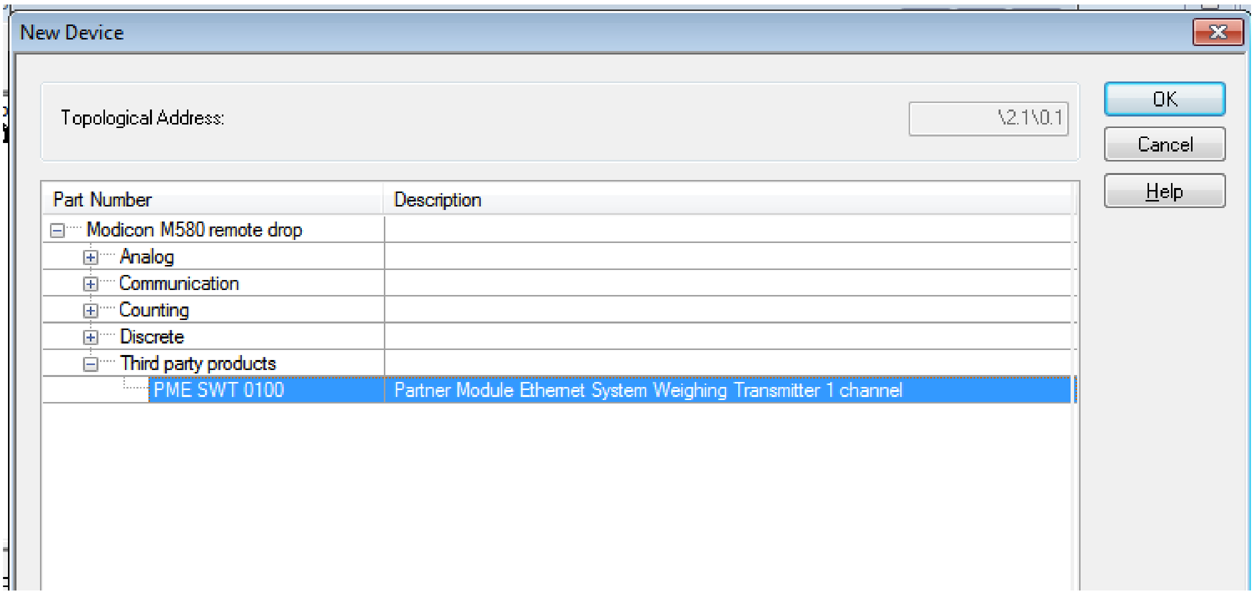
Make sure that the Drop End communicator, selected, should be BME CRA 312 10.2 . If BMX CRA 312 xx.x is selected, then Unity will not allow adding PME SWT device to the remote rack.

Add proper power supply by right clicking on the first slot of remote rack and selecting proper power supply from Pop-up screen.



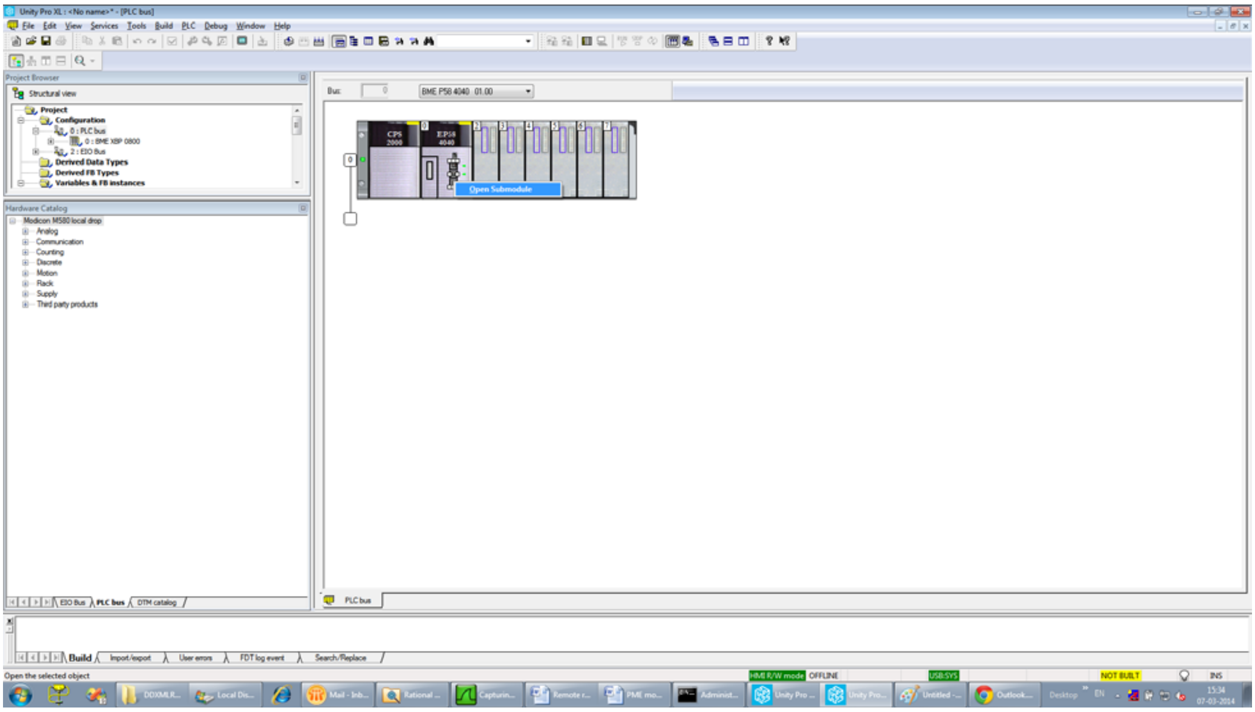


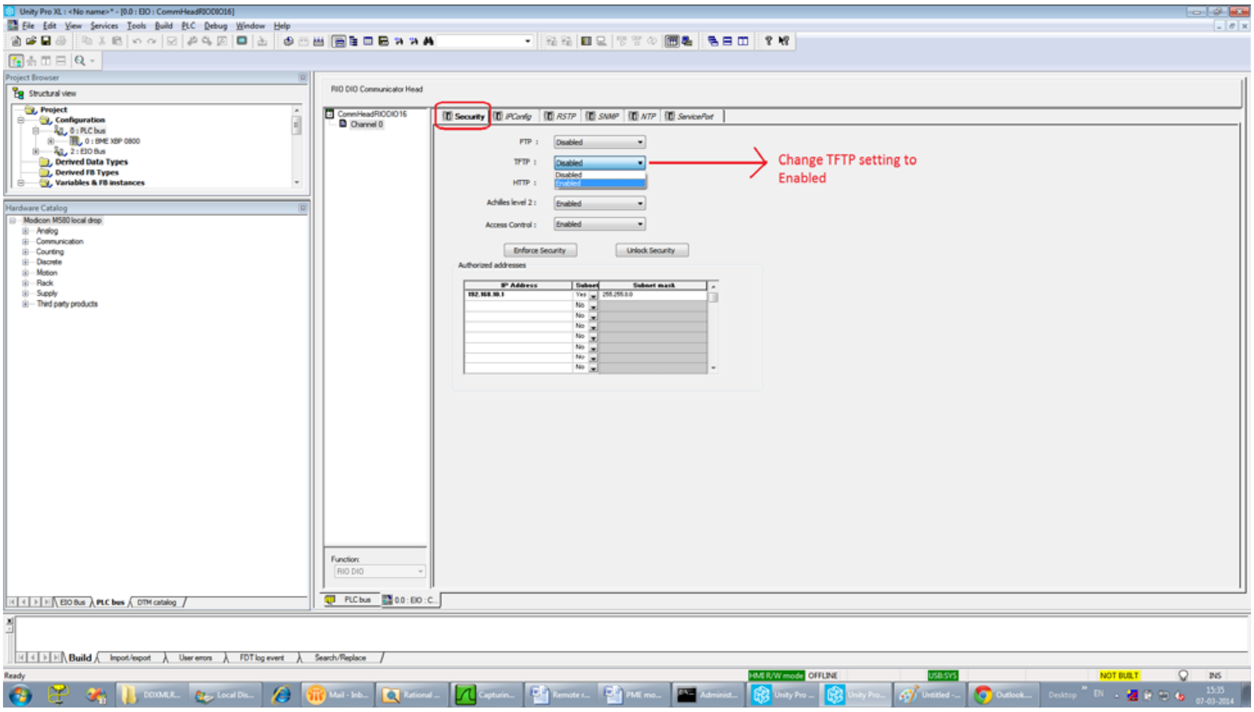
Now add PME SWT module by right clicking empty slot and selecting PME SWT module from new device Pop up screen.



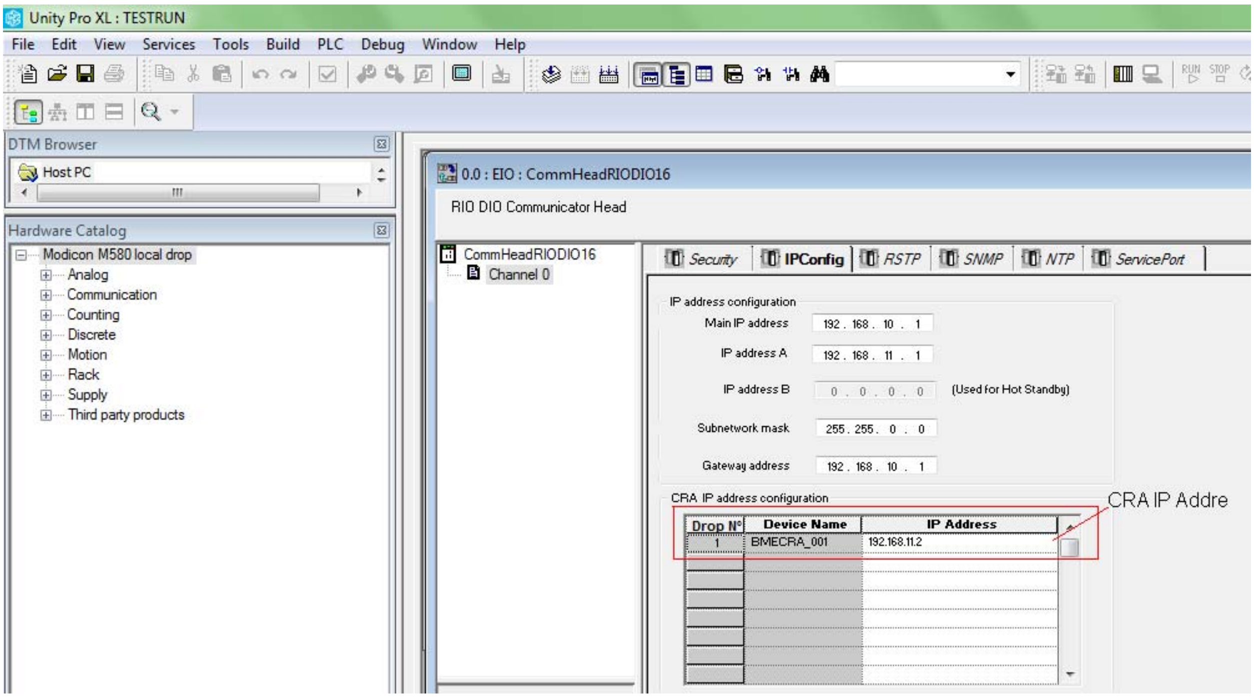
Make sure that you do not select slot no: *2*, *8, 10* and *11* to add PME SWT device as they do not have Ethernet port

Go to PLC bus (Project Browser->Configuration->PLC bus). Click on the Ethernet port available on the CPU which opens the port configuration. Change the TFTP setting to *"Enabled"*.

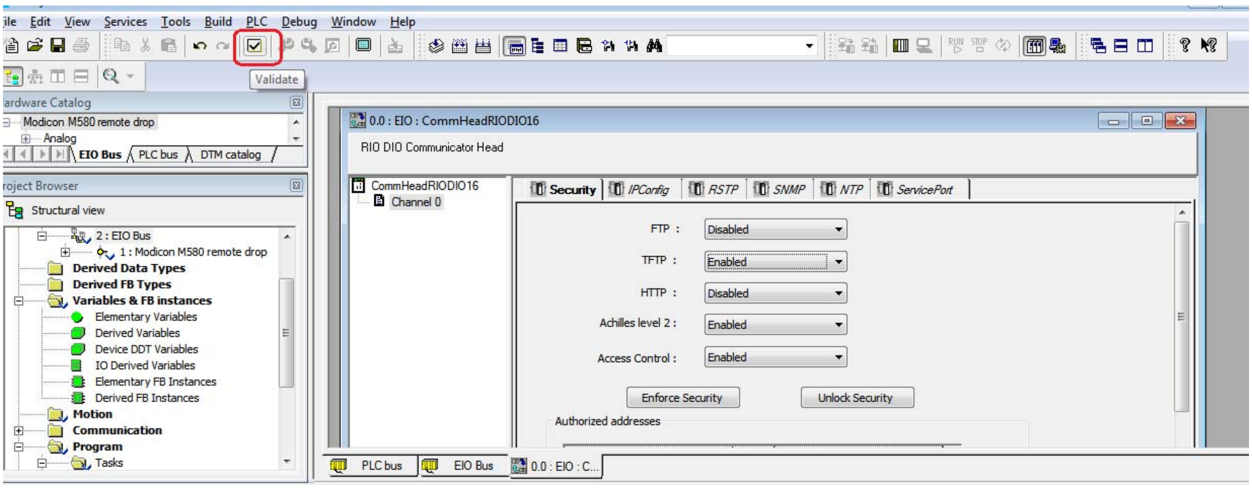




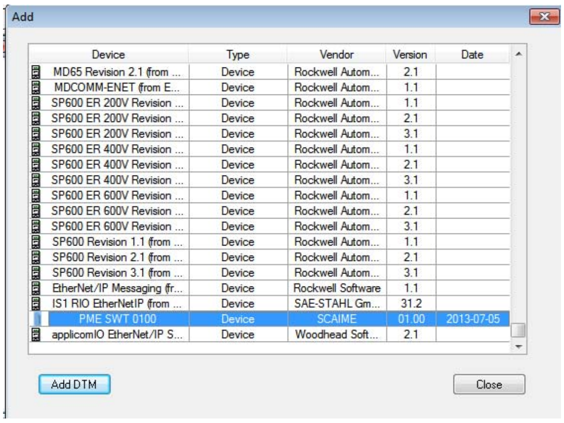
To change CRA IP Address, Navigate to IPConfig tab and set the CRA IP address



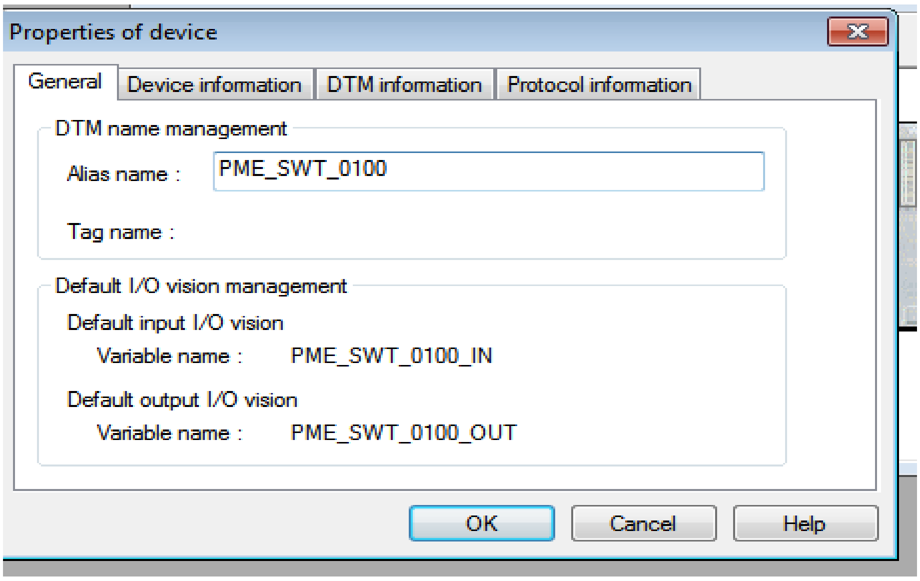
After changing TFTP setting to “Enabled”, click validate button



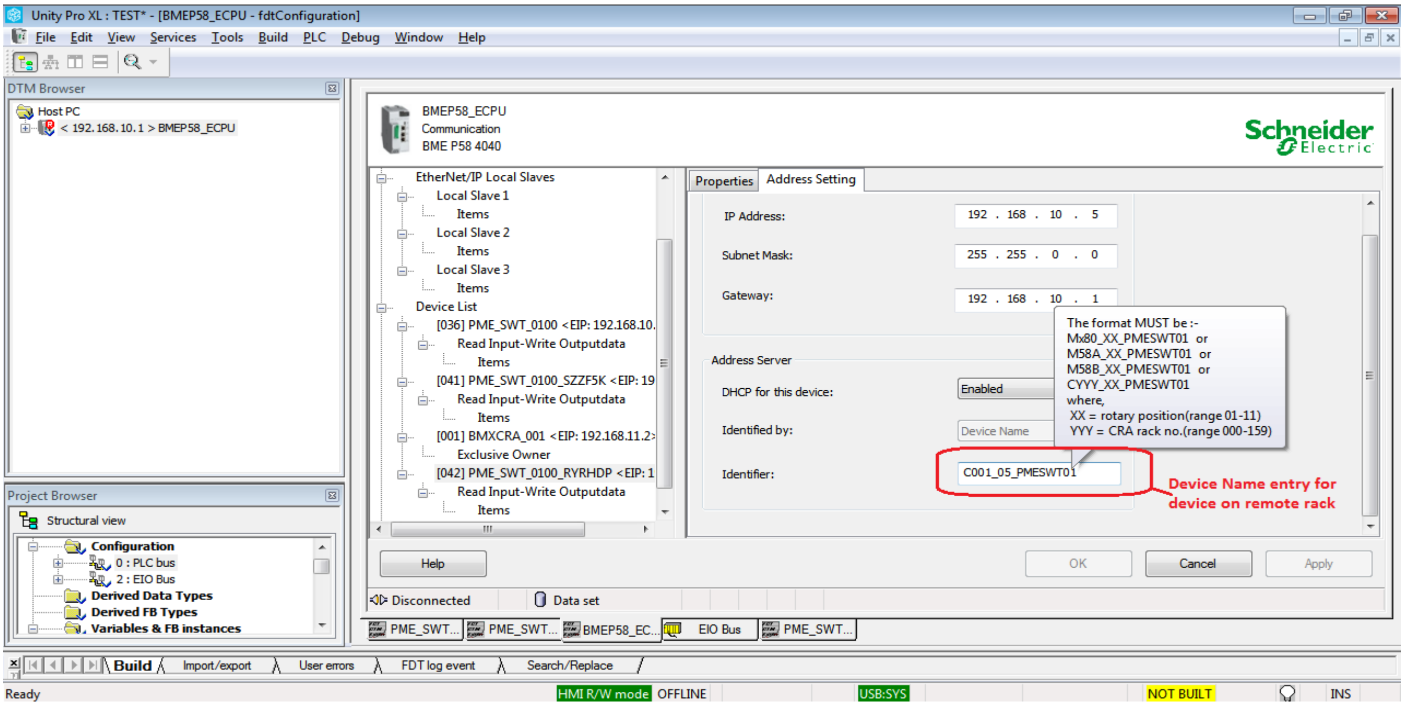
Open DTM browser screen from Menu *Tools -> DTM* Browser or with keyboard shortcut *Alt + Shift +1*. Right click the master DTM in the DTM browser and select Add... from context menu. From the Add popup screen, select PME SWT 0100 device DTM and click Add DTM button



Provide the alias name for the DTM of your choice and click OK on Device Property popup screen.

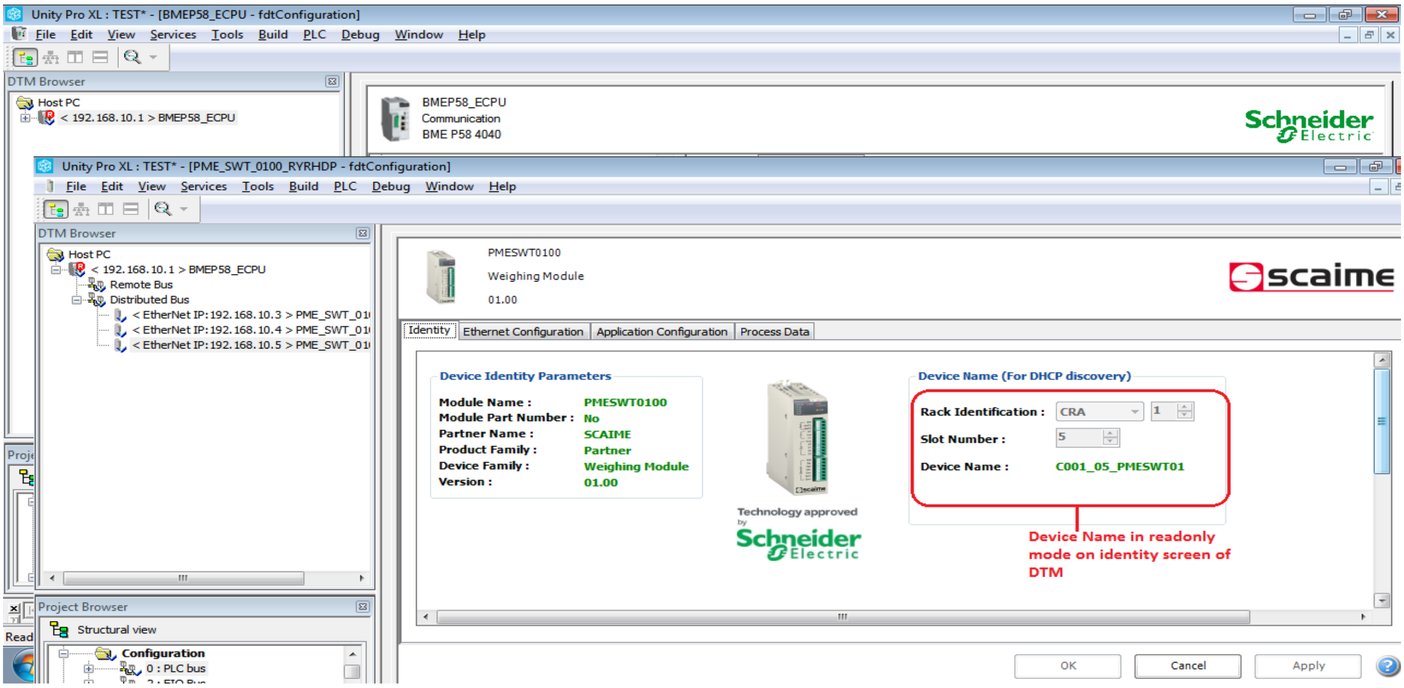


Now open M580 DTM screen by double clicking M580 DTM in DTM browser. To configure the device name, go to the address setting tab of PME SWT device info page, select Rack Identification as CRA, provide the drop number which has been set for the CRA and finally provide slot number where the PME SWT device is put on the remote rack. If desired, user can change the IP Address of PME SWT device in IP Address field.



Click Apply of the M580 DTM page and click menu Build -> Rebuild All Project to build the Unity Pro project.

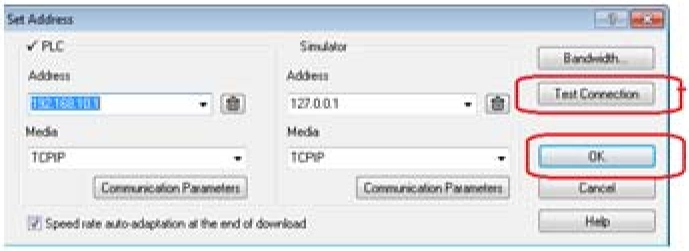
Now open the PME SWT DTM by double clicking the device in DTM browser. Open Identity tab of the DTM screen as show in figure below.



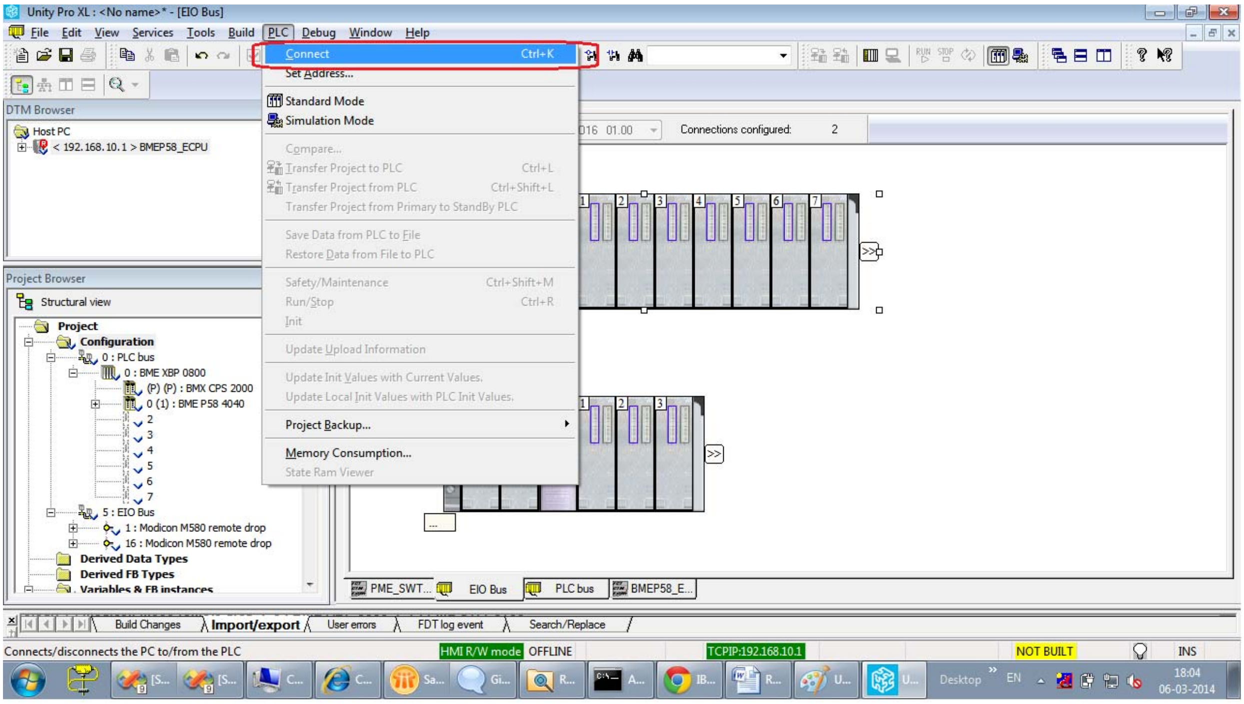
6.3. Device configuration transfer from Unity Pro:

Once step1 and step2 are over, Power cycle the M580 local bus as well as remote bus.

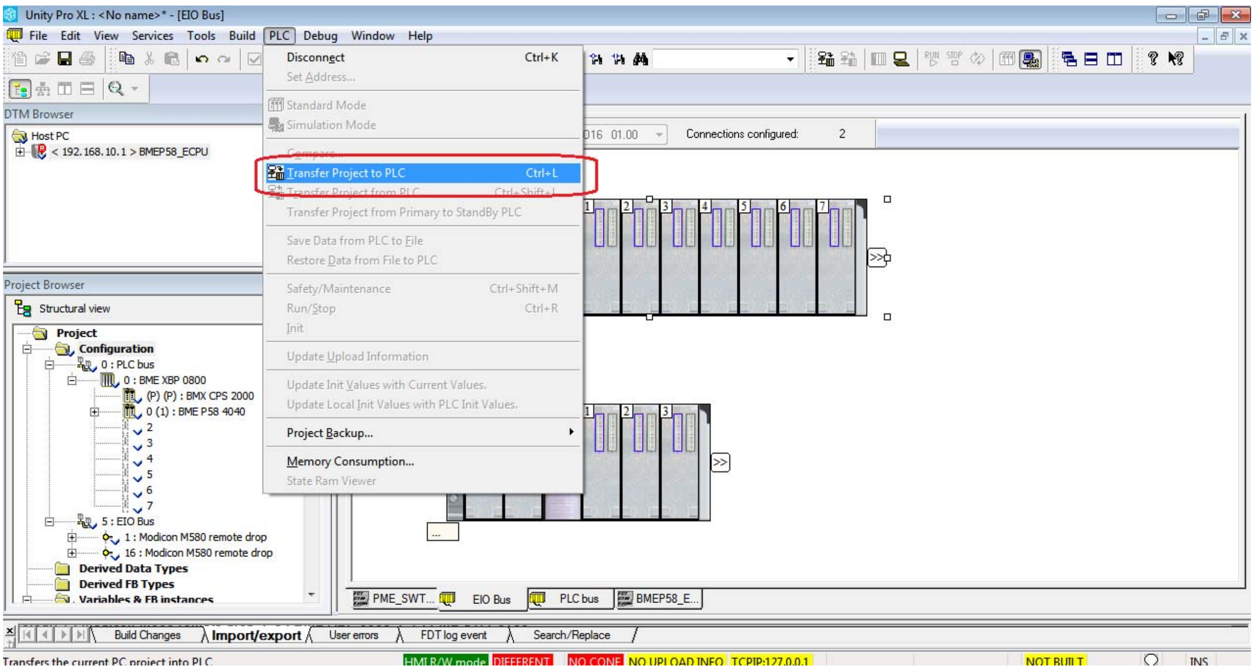
In UnityPro menu bar, go to *PLC->set address* and configure the address as follows, the media must be TCPIP. You can verify the provided address is available or not using Test Connection.



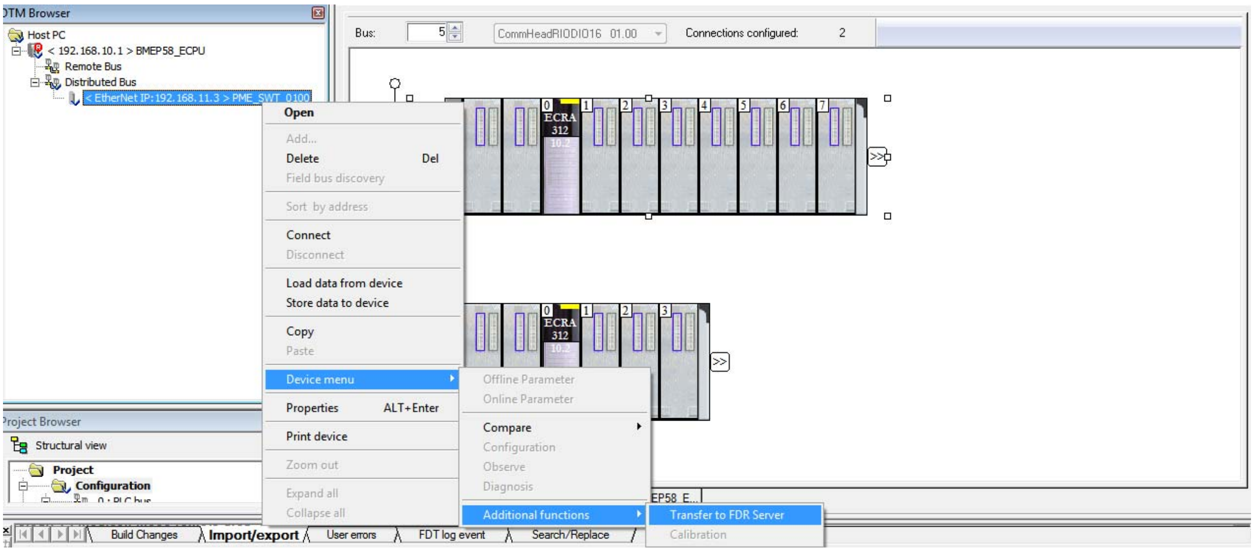
In UnityPro menu bar, go to *PLC-> Connect* to connect with M580 CPU.



Once the connection is established with the M580 CPU, transfer the Unity Pro project from menu *PLC-> Transfer Project to PLC*



Once the PLC program is transferred, transfer the PRM file to FDR server from device DTM menu *Device Menu -> Additional Function -> Transfer to FDR server* option.

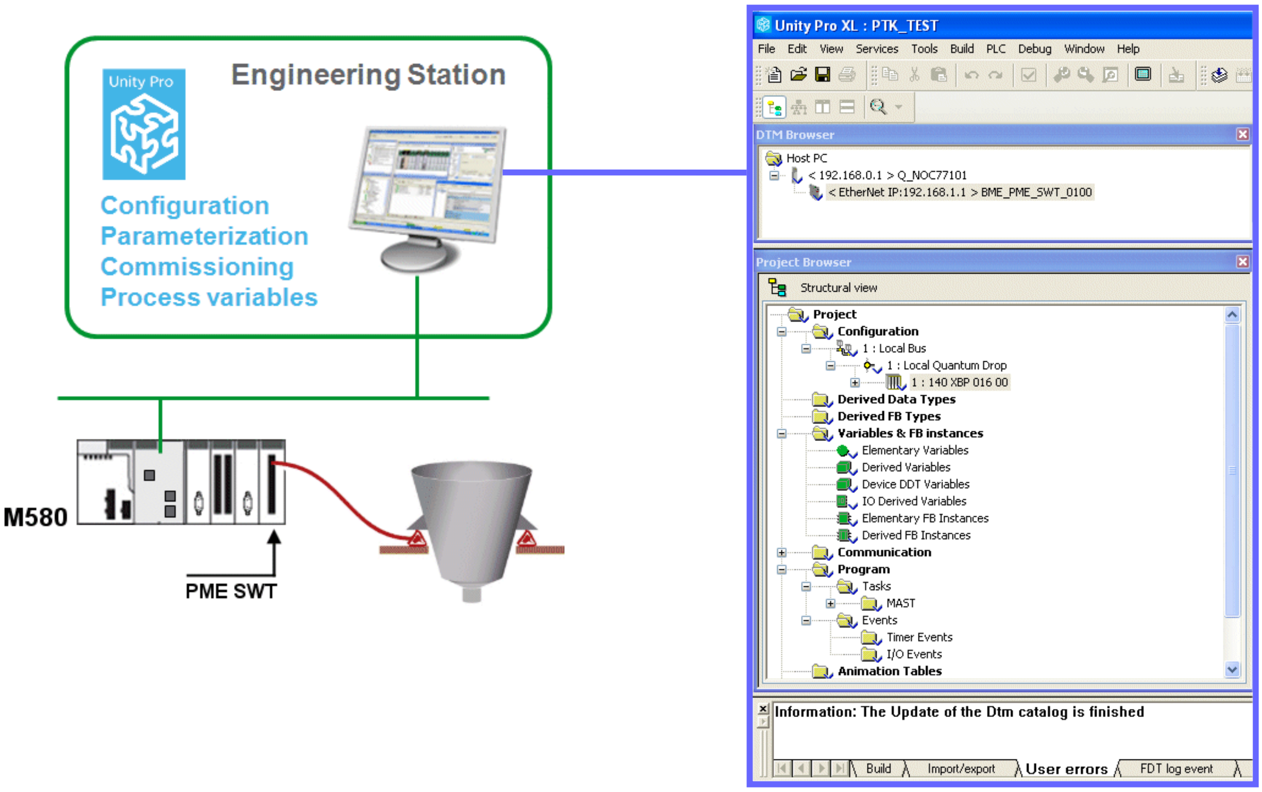


Once the Transfer to FDR Server function is successful, Power cycle the complete M580 system (both M580 local bus as well as CRA remote bus).

After power cycle, the M580 system along with Remote rack should be up and running.

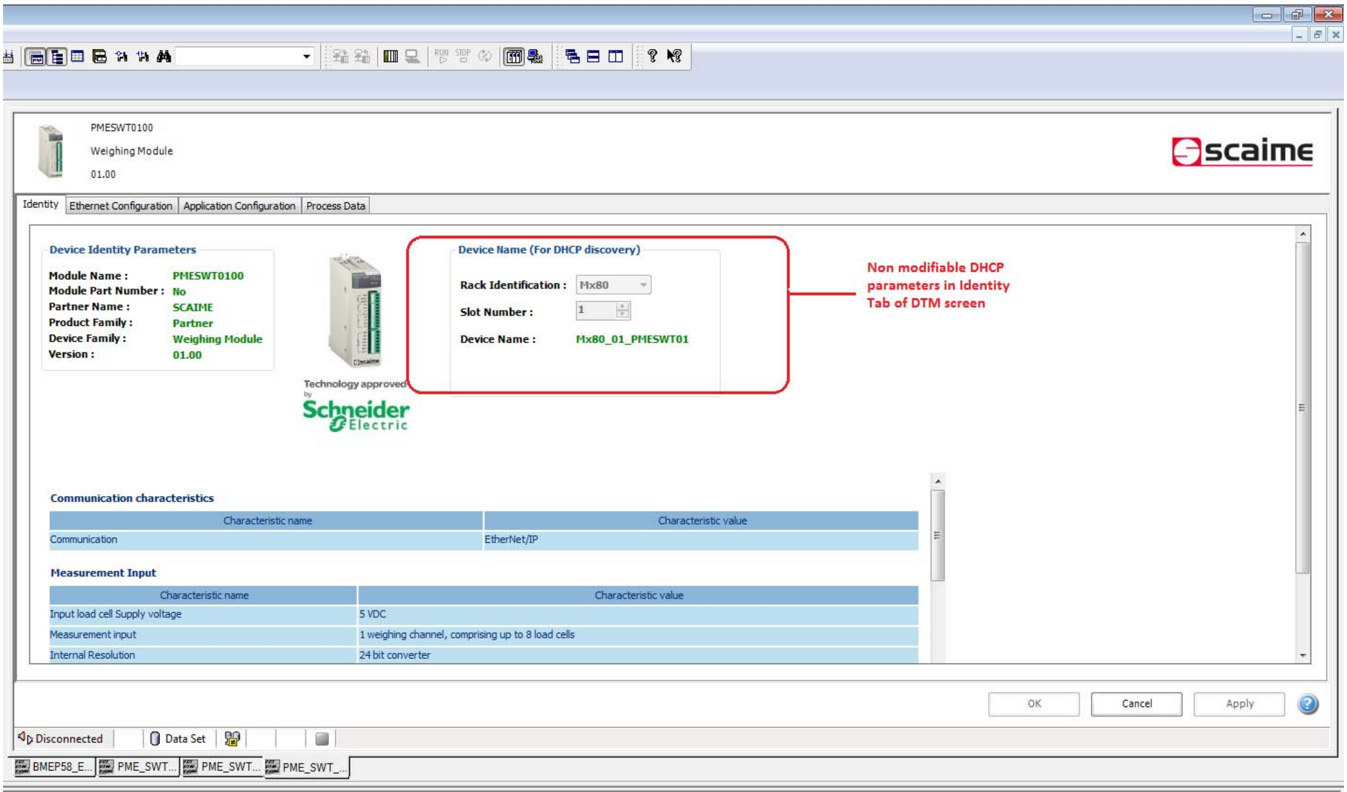
7. Configuration with Unity Pro

The PME SWT is configured using DTM integrated into Schneider Electric Unity Pro software via the Ethernet backplane. From the Unity DTM browser, it is possible to open the Device Editor, which can be used to configure the weighing module parameters presented in the DTM.



7.1. Identity tab

This tab of UNITY DTM Browser allows showing the name and main specifications of the module.



7.2. Application configuration and process data tab

This tab allows showing and change the module functional parameters for application configuration

Parameter	*ID*	*Length in byte*	*Services supported*	*Type*	*Description*
HMI address	*1000*	*1*	*R/W*	*BYTE*	*Device external Modbus RTU communication interface address* • *1 to 127*
HMI baud rate	*1001*	*1*	*R/W*	*BYTE*	*Device external Modbus RTU communication interface baud rate* • *0 = 9600 bauds* • *1 = 19200 bauds* • *2 = 38400 bauds* • *3 = 57600 bauds* • *4 = 115200 bauds*
HMI Panel Setting	*1002*	*2*	*R/W*	*WORD*	*Auxiliary HMI panel control setting*
• *Language*				*Bits field (b_0-b_3)*	• *0 = English* • *1 = French*
• *Reserved*				*Bits field (b_4-b_7)*	*For evolution*
• *Keyboard visibility*				*BOOL(b_8)*	• *0 = Visible* • *1 = Not visible*
• *Pass Word Management*				*BOOL(b_9)*	• *0 = Disable* • *1 = Enable*
• *Panel locked Management*				*BOOL(b_{10})*	• *0 = Not locked* • *1 = Locked*
• *Reserved*				*Bits field (b_{11}-b_{12})*	*For evolution*
HMI Password	*1003*	*4*	*R/W*	*STRING*	*Protected by password device's functionalities or parameters against modification through HMI.*
Input 0 Setting	*1004*	*1*	*R/W*	*BYTE*	*Logical input I0 setting*
• *Assignment function*				*Bits field (b_0-b_3)*	• *0 = None* • *1 = Tare* • *2 = Zero* • *3 = Cancel tare* • *4 = Zero in specified time* • *5 = Tare in specified time* • *6 = Active dosing process* • *15 = Test function*
• *Logic*				*BOOL(b_4)*	• *0 = Negative* • *1 = Positive*
• *Reserved*				*Bits field (b_5-b_7)*	*For evolution*
Input 1 Setting	*1005*	*1*	*R/W*	*BYTE*	*Logical input I1 setting*
• *Assignment function*				*Bits field (b_0-*	• *0 = None*

Parameter	ID	Length in byte	Services supported	Type	Description
				b_3)	• 1 = Tare • 2 = Zero • 3 = Cancel tare • 4 = Zero in specified time • 5 = Tare in specified time • 6 = Active dosing process • 15 = Test function
• Logic				BOOL(b_4)	0 = Negative 1 = Positive
• Reserved				Bits field (b_5-b_7)	For evolution
Inputs Holding time	1006	2	R/W	UINT	Minimum time is ms to be elapsed before take into account input changed.
S0S1 outputs setting	1007	2	R/W	WORD	Logical dosing outputs S0(coarse feed) and S1(fine feed) setting
• S0S1 or Dosing process Activation				BOOL(b_0)	• 0 = Disable • 1 = Enable
• Logic				BOOL(b_1)	• 0 = Negative • 1 = Positive
• S0S1 dosing direction				BOOL(b_2)	• 0 = Unloading • 1 = Filling
• Dosing coarse feed mode				BOOL(b_3)	• 0 = Only coarse feed output is enable at start • 1 = Coarse & fine feed outputs are enable at start
• Dosing comparison source				BOOL(b_4)	• 0 = Compare with Net weight • 1 = Compare with Gross weight
• Reserved				Bits field (b_5-b_{15})	For evolution
Coarse feed cut off point	1008	4	R/W	DWORD	Depending on the direction defined, S0 output goes to zero when that threshold is met • 0 to 500.000
Fine feed cut off point	1009	4	R/W	DWORD	Depending on the direction defined, S1 output goes to zero when that threshold is met • 0 to 500.000
Fine feed mask time	1010	2	R/W	UINT	It defines the time in ms after the CF, during which the module no longer checks the weight, to mask perturbations at feed change. • 0 to 65535ms
Output S2 Setting	1011	1	R/W	BYTE	Logical output S2(Threshold control) setting
• S2 Activation				BOOL(b_0)	• 0 = Disable output 2 threshold management

Parameter	ID	Length in byte	Services supported	Type	Description
					• 1 = Enable output 2 threshold management
• Logic				BOOL(b_1)	• 0 = Negative • 1 = Positive
• Threshold mode				BOOL(b_2)	• 0 = Windows • 1 = Hysteresis
• Threshold comparison source				Bits field (b_3-b_5)	• 0 = Net weight • 1 = Gross weight • 2 = Flow measurement
• Reserved				Bits field (b_6-b_7)	For evolution
S2 threshold low value	1012	4	R/W	DWORD	Depending on the threshold mode, S2 output changes state when that set point is met
S2 threshold high value	1013	4	R/W	DWORD	Depending on the threshold mode, S2 output changes state when that set point is met
Output S3 Setting	1014	1	R/W	BYTE	Logical output S3(Threshold control) setting
• S3 Activation				BOOL(b_0)	• 0 = Disable output 3 threshold management • 1 = Enable output 3 threshold management
• Logic				BOOL(b_1)	• 0 = Negative • 1 = Positive
• Threshold mode				BOOL(b_2)	• 0 = Windows • 1 = Hysteresis
• Threshold comparison source				Bits field (b_3-b_5)	• 0 = Net weight • 1 = Gross weight • 2 = Flow measurement
• Reserved				Bits field (b_6-b_7)	For evolution
S3 threshold low value	1015	4	R/W	DWORD	Depending on the threshold mode, S3 output changes state when that set point is met
S3 threshold high value	1016	4	R/W	DWORD	Depending on the threshold mode, S3 output changes state when that set point is met
A/D converter setting	1017	2	R/W	WORD	To define device internal sampling and rejection frequencies
• Rejection frequency				BOOL(b_4)	• 0 = 60 Hz • 1 = 50 Hz
• Sampling frequency				Bits field (b_0-	If 50 Hz rejection	If 60 Hz rejection

Parameter	ID	Length in byte	Services supported	Type	Description
				b_3)	• 0 = 100 meas/s • 1 = 50 meas/s • 2 = 25 meas/s • 3 = 12.5 meas/s • 4 = 6.25 meas/s • 11 = 400 meas/s • 12 = 200 meas/s • 0 = 120 meas/s • 1 = 60 meas/s • 2 = 30 meas/s • 3 = 15 meas/s • 4 = 7.5 meas/s • 11 = 480 meas/s • 12 = 240 meas/s
Low pass filter setting	*1018*	*2*	*R/W*	*WORD*	*To define low pass filter activation and order*
• *Reserved*				*Bits field* (b_0-b_7)	• *0 = For evolution*
• *Filter order*				*Bits field* (b_7-b_{15})	• *0 = low-pass filter disabled* • *2 = 2nd order low-pass filter* • *3 = 3rd order low-pass filter*
Filter cut off frequency	*1019*	*2*	*R/W*	*UINT*	*Low-pass filter cut-off frequency expressed in Hz and multiplied by 100* *From 10 to 20000*
Average filter depth	*1020*	*2*	*R/W*	*UINT*	• *0 = Mean filter disabled* • *2, 4, 8, 16, 32, 64 and 128*
Average flow rate depth	*1021*	*2*	*R/W*	*UINT*	• *2, 4, 8, 16, 32, 64 and 128*
Flow rate unit	*1022*	*2*	*R/W*	*STRING*	
Metrology switches	*1023*	*1*	*R/W*	*BYTE*	*Device legal mode management*
• *Legal for trade activation*				*BOOL*(b_0)	• *0 = Disable* • *1 = Enable*
• *Legal sealing activation*				*BOOL*(b_1)	• *0 = Disable* • *1 = Enable*
• *Reserved*				*Bits field* (b_2-b_7)	*For evolution*
Legal for trade version	*1024*	*1*	*RO*	*BYTE*	*Legal mode firmware version*
Legal for trade counter	*1025*	*2*	*RO*	*UINT*	*The legal for trade counter is incremented every time if at least one (or several) of legal for trade settings has been modified*
Legal for trade CRC16	*1026*	*2*	*RO*	*UINT*	*New legal for trade checksum is calculated every time if at least one (or several) of legal for trade settings has been modified*
Zero functions	*1027*	*2*	*R/W*	*WORD*	*Device zero tracking and initial zero functions activation*
• *Zero tracking activation*				*BOOL*(b_0)	• *0 = Disable* • *1 = Enable*

Parameter	ID	Length in byte	Services supported	Type	Description
• *Initial zero activation*				*BOOL(b_1)*	• *0 = Disable* • *1 = Enable*
• *Reserved*				*Bits field (b_2-b_{15})*	*For evolution*
Stability criterion	*1028*	*1*	*R/W*	*BYTE*	*Measurement stability criteria define* • *0 = (None) no motion detection (always stable)* • *1 = 0.25 division* • *2 = 0.5 division* • *3 = 1 division* • *4 = 2 divisions*
Zero/Tare specified time	*1029*	*2*	*R/W*	*UINT*	*Time in ms in which gross measurement average is done to make volatile dynamic zero or tare.*
Preset tare value	*1030*	*4*	*R/W*	*DWORD*	*This parameter contents user previous tare value and could be set on Net measurement on user command*
Maximum capacity	*1031*	*4*	*R/W*	*DWORD*	*Maximum weight that it is possible to weigh, without dead weight of the empty receiver*
Calibration unit	*1032*	*4*	*R/W*	*STRING*	*Weight measurement unit (mg, g, kg, t, lb…)*
Scale interval	*1033*	*2*	*R/W*	*UINT*	*The 'scale interval' is the minimal difference between two consecutive indicated values* • *1, 2, 5, 10, 20, and 50*
Decimal point position	*1034*	*1*	*R/W*	*BYTE*	*Number of digits after the decimal point* • *0, 1, 2, 3, 4, 5, and 6*
Sensor sensitivity(mV/V)	*1035*	*4*	*R/W*	*DWORD*	*Used to achieve theoretical calibration. Load cell sensitivity in mV/V at maximum capacity. This setting is expressed as a 10^{-5} value that means 7875 is equivalent to 0.07875 mV/V load cell sensitivity* • *0 up to 6 mV/V*
Zero sensitivity(mV/V)	*1036*	*4*	*R/W*	*DWORD*	*Used to achieve theoretical calibration. Load cell sensitivity in mV/V for the dead load. This setting is expressed as a 10^{-5} value that means 7875 is equivalent to 0.07875 mV/V* • *-6 up to 6 mV/V*
Number of segments	*1037*	*2*	*R/W*	*UINT*	*Defines how many calibration loads reference will be used during the physical calibration* • *1, 2 and 3*

Parameter	ID	Length in byte	Services supported	Type	Description
Calibration load 1	*1038*	*4*	*R/W*	*DWORD*	*User weight value corresponding to 1st calibration segment reference*
Calibration load 2	*1039*	*4*	*R/W*	*DWORD*	*User weight value corresponding to 2nd calibration segment reference*
Calibration load 3	*1040*	*4*	*R/W*	*DWORD*	*User weight value corresponding to 3rd calibration segment reference*
Calibration zero reference	*1041*	*4*	*R/W*	*DWORD*	*Zero reference measured during a physical calibration. Also used for theoretical zero calibration*
Global span adjustment	*1042*	*4*	*R/W*	*DWORD*	*Allows adjusting initial calibration. This setting is expressed as a 10^{-6} value that means 1000000 is equivalent to a span adjusting coefficient that is equal to 1.*
Span adjustment 1	*1043*	*4*	*R/W*	*REAL*	*Automatically produced during calibration process. Allows to restore a previous calibration*
Span adjustment 2	*1044*	*4*	*R/W*	*REAL*	*Automatically produced during calibration process. Allows to restore a previous calibration*
Span adjustment 3	*1045*	*4*	*R/W*	*REAL*	*Automatically produced during calibration process. Allows to restore a previous calibration*
Calibration place g value	*1046*	*4*	*R/W*	*DWORD*	*Allows compensating the gravity difference between device calibrated place and using place.*
Using place g value	*1047*	*4*	*R/W*	*DWORD*	*Allows compensating the gravity difference between device calibrated place and using place.*
Gross measurement	*1048*	*4*	*RO*	*DWORD*	*the 'gross weight' stands for the digital value after measurement scaling. It is affected by all the 'zero' functions*
Tare value	*1049*	*4*	*RO*	*DWORD*	*the 'tare weight' stores the volatile calibrated value which is subtracted from the 'gross weight' to give the 'net weight'*
Net measurement	*1050*	*4*	*RO*	*DWORD*	*the 'net weight' stands for the digital value after measurement scaling and tare subtraction*
Factory calibrated points	*1051*	*4*	*RO*	*DWORD*	*the 'factory calibrated points' contains the measurement value without the user calibration layer. That means it is directly linked to the analog input voltage and factory calibartion*
flow rate	*1052*	*4*	*RO*	*REAL*	*Flow rate*

Parameter	ID	Length in byte	Services supported	Type	Description
Measurement status	*1054*	*2*	*RO*	*UINT*	*This parameter contents all information's related to the device internal measurement process status*
• *Reserved*				*Bits field (b_0-b_1)*	
• *A/D converter fault*				*Bits field (b_2-b_3)*	• *0 = Measurement is OK (no error)* • *1 = Gross weight < - (Max. capacity)* • *2 = Gross weight > (Max. capacity)* • *3 = Converter saturation or analog signal out of A/D input range*
• *Stability flag*				*BOOL(b_4)*	• *0 = Measurement is not stable* • *1 = Measurement is stable*
• *Measurement out of ¼ division flag*				*BOOL(b_5)*	• *0 = false* • *1 = True*
• *ROM Memory status*				*BOOL(b_6)*	• *0 = Memory ok* • *1 = Memory failure (measurements shall be set to 0xFFFFFFFF)*
• *Preset tare process flag*				*BOOL(b_7)*	• *0 = None* • *1 = At least one preset tare is processed*
• *Logical Input I0 state flag*				*BOOL(b_8)*	• *0 = Disable* • *1 = Enable*
• *Logical Input I1 state flag*				*BOOL(b_9)*	• *0 = Disable* • *1 = Enable*
• *Logical Output S0(Dosing coarse feed) state flag*				*BOOL(b_{10})*	• *0 = Disable* • *1 = Enable*
• *Logical Output S1(Dosing fine feed) state flag*				*BOOL(b_{11})*	• *0 = Disable* • *1 = Enable*
• *Logical Output S2(Threshold) state flag*				*BOOL(b_{12})*	• *0 = Disable* • *1 = Enable*
• *Logical Output S3(Threshold) state flag*				*BOOL(b_{13})*	• *0 = Disable* • *1 = Enable*
• *Tare process flag*				*BOOL(b_{14})*	• *0 = None* • *1 = At least one tare is processed*
• *Zero/Tare process flag*				*BOOL(b_{15})*	• *0 = None* • *1 = At least one zero/tare is processed*
Device status	*1055*	*2*	*RO*	*UINT*	*Informations on device calibration and option*
• *Reserved*				*BOOL(b_0)*	
• *User calibration status*				*BOOL(b_1)*	• *0 = Any user calibration is applied* • *1 = At least one user calibration is processed*

Parameter	ID	Length in byte	Services supported	Type	Description
• *User calibration type*				*Bits field (b_2-b_4)*	• *0 = None* • *1 = Physical calibration is set* • *2 = Theoretical calibration is set*
• *Reserved*				*Bits field (b_5-b_7)*	*For evolution*
• *Load cell wiring mode*				*BOOL(b_8)*	• *0 = 4-wire* • *1 = 6-wire*
• *Terminal RS485 resistor*				*BOOL(b_9)*	• *0 = Terminal resistor is not set* • *1 = Terminal resistor is set*
• *Reserved*				*Bits field (b_{10}-b_{15})*	*For evolution*
Command register	*1056*	*2*	*R/W*	*UINT*	*Allows user to send functional command to the device.*
Response register	*1057*	*2*	*RO*	*UINT*	*Allows user to send functional command to the device.*
Load cell wiring mode and terminal resistor	*1058*	*1*	*R/W*	*BYTE*	
• *Load cell wiring*				*BOOL(b_0)*	• *0 = 4-wire* • *1 = 6-wire*
• *terminal resistor*				*BOOL(b_1)*	• *0 = Terminal resistor is not set* • *1 = Terminal resistor is set*

8. Module specifications

The general characteristics for the PME SWT weighing modules are as follows.

General			
Backplane Power consumption	*At 24 VDC*	*max*	*150 mA*
Power dissipation		*max*	*3,6 W*
Bridge excitation voltage			*5 VDC*
Input sensor range min/max			*+-7.8 mV/V*
Minimum input sensor resistance			*42 Ohm*
Sensor connection			*4/6 wires, software selection*
Reliability			*> 500 000 Hours at Tambient = 30 °C*
Dimensions			*100x100x32 mm3*
Weight			*170 g*
Standard Operating temperature			*-10 °C + 60°C*
Metrological temperature			*- 10 °C + 40°C*
Storage temperature			*- 40 ° + 85 °C*
EMC compliance			*IEC 61131-2:2007*
Positive logic input			
Number of type 3 inputs			*2*
Nominal input values		*Voltage*	*24 VDC*
		Current	*7 mA*
Threshold input values	*At 1*	*Voltage*	*≥ 11 V*
		Current	*≥ 2 mA (for U ≥ 11 V)*
	At 0	*Voltage*	*≤ 5 V*
		Current	*≤ 1.5 mA*
Input impedance	*At nominal U*		*3.4 kΩ*
Reverse polarity			*Protected*
IEC 61131-2 compliance			*Type 3*
Input Dielectric Strength			*1500 V rms, 50/60 Hz for 1 min*
Dielectric Strength	*Output/ground or output/internal logic*		*1500 V rms, 50/60 Hz for 1 min*
	Between groups of inputs and outputs		*500 V rms, 50/60 Hz for 1 min*
Type of Input			*Current sink*
Positive logic static outputs			
Number of outputs			*4*
Nominal values	*Voltage*		*± 24 V_{DC}*
	Current		*0.25 A*

Threshold values	*Voltage (including ripple)*	*± 30 V_{DC}*
	Current/channel	*0.3 A*
	Current/module	*4 x 0.3 A*
Compatibility with IEC 61131-2 direct inputs		*Yes (Type 3)*
Built in protection	*Against overvoltage*	*Yes, by TVS diode*
	Against short circuit and overload	*No protection*
Dielectric Strength	*Output/ground or output/internal logic*	*1500 V rms, 50/60 Hz for 1 min*
	Between groups of inputs and outputs	*500 V rms, 50/60 Hz for 1 min*
Resistance of insulation		*> 10 MOhm*

Metrological specifications		
Input signal resolution		*1 000 000*
Conversion rate		*6.25 to 400 conv./s*
Accuracy class		*+-0.005 %FS*
Linearity deviation		*+-0.003 % FS*
Thermal zero shift		*+-0.00015 % / °C*
Thermal span shift		*+-0.0002 % / °C*
Internal resolution		*24 bits*
Scaled measured resolution		*+- 500 000 pts*
Internal Conversion rate		*6.25 .. 400 conv/s*
Max update frequency of data on the backplane		*100 Hz*

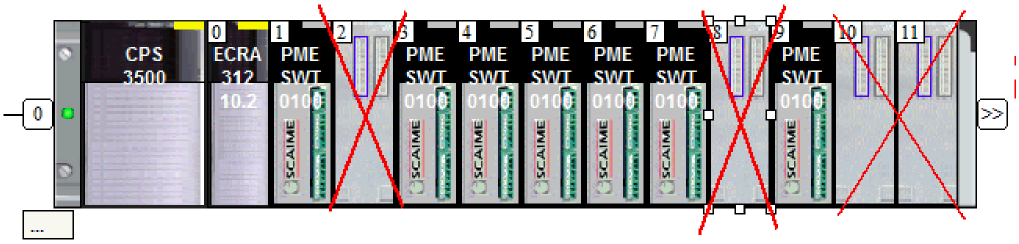
9. Installing PME SWT weighing module

9.1.1. Maximum Configuration in PME SWT weighing module

The weighing module PME SWT is standard format and therefore occupies a single position in the BME XBP xx00 racks. It can be installed in all positions on the rack except for the first two (PS and 00) which are reserved for the rack power supply module (BMX CPS xxxx) and processor module (BME P58 xxxx) respectively, and the slots 2, 8, 10 and 11 (12 slots racks only) which are reserved for gateway products.

They are powered by the rack back bus, and can be positioned either in the standard rack or in an extendable rack.

Warning: With a 12 slots rack, slots 2, 8, 10 and 11 are reserved for gateway products and are not available for module installation.



- Max. number of modules on each X80 RIO drop – 7 PME SWT
- Max. number of modules on each M580 local CPU rack – 6 PME SWT

9.1.2. Installation precaution

The installation and removal of the weighing module can be done with the CPU **switched on** (without risk of damage to the module or disruption to the CPU).

9.1.3. Order of Module Installation

Install modules in the selected rack in Unity Pro in this order:

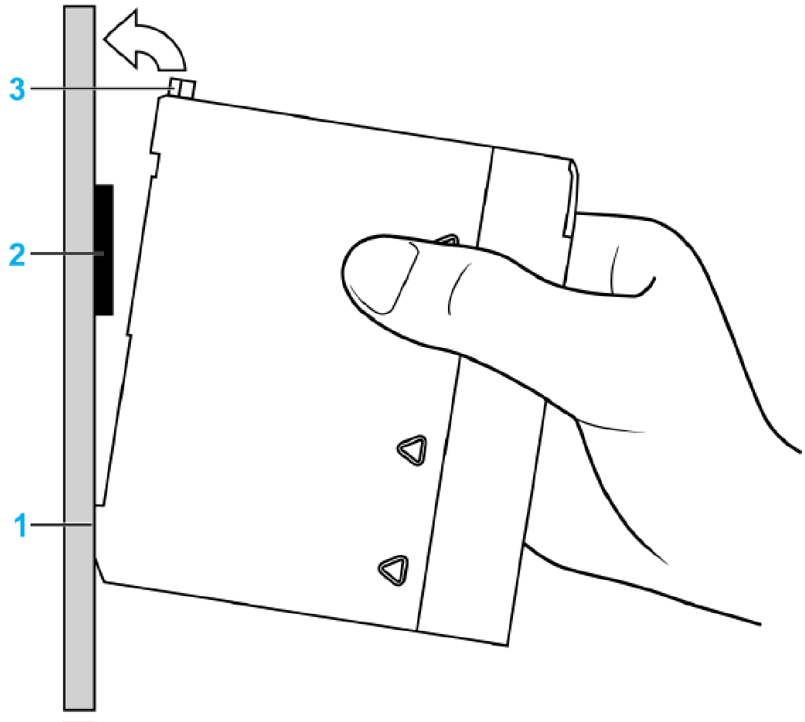
1. Install the adapter module

2. Install a power supply

3. Install PME SWT weighing modules

9.1.4. Mounting a Module

Use this procedure to install adapters and I/O modules in a rack:

Step	Action
1	Hold the module at an angle and mount it on the 2 hooks near the bottom of the backplane. The figure shows the correct way to hold the module: 
2	Swing the module up so that the connector engages the backplane connector.
3	Use a phillips-head screw driver to tighten the screw at the top of the module 2...4 in-lbs (0.22 to 0.45 N•m) of torque.

9.1.5. Replacing a Module

You can replace an Modicon X80 module at any time using another module with compatible firmware. The replacement module obtains its operating parameters over the backplane connection from the CPU. The transfer occurs immediately at the next cycle to the device.

9.1.6. Installation Results

Applying power to the main local rack after the adapter module is installed can result in either:

Successful installation:

- Initialization is finished.
- Interconnections to other modules are validated (drop adapter module only).

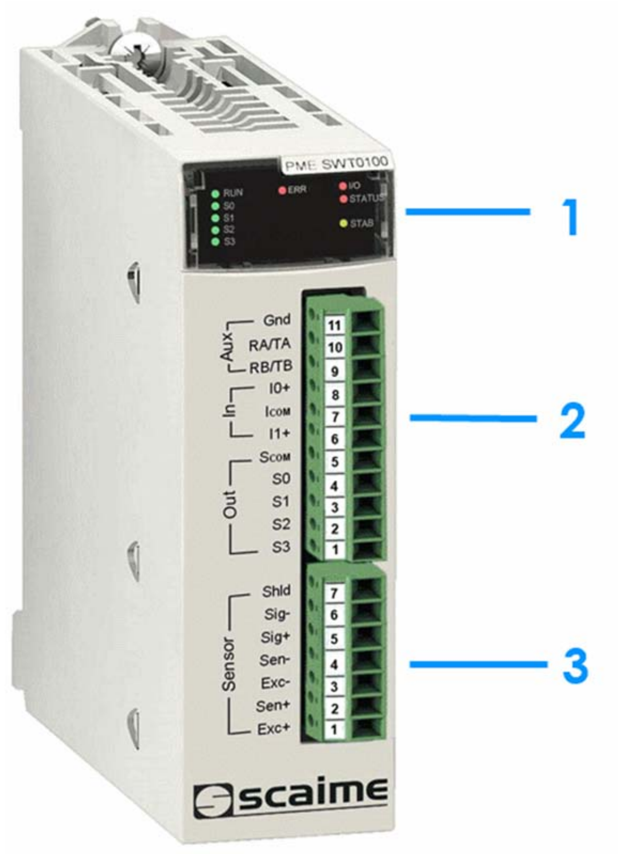
Unsuccessful installation:

- Initialization does not finish.
- Interconnections to other modules are not validated (drop adapter modules only).

You can see the status of the installation on the adapter LED display.

9.1.7. External Features

This weighing module has the same dimensions and installation constraints as the other modules in the Modicon X80 product line:



1 LED display

2 Connector

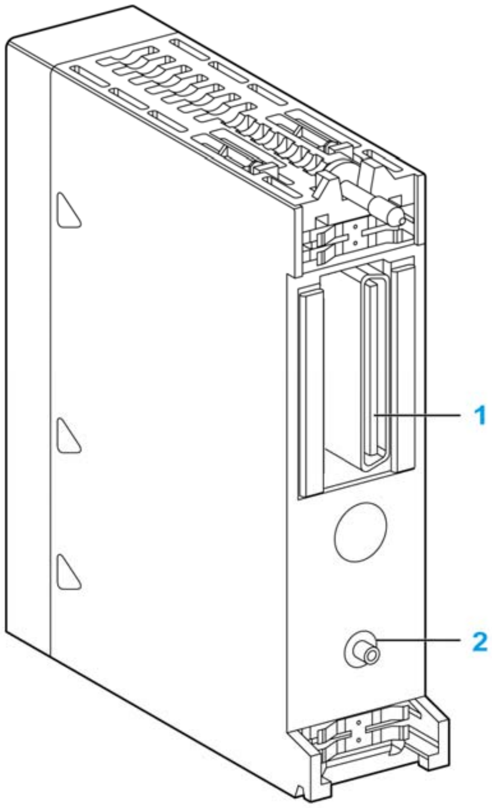
3 Connector

9.1.8. PME SWT Keying Pin

The PME SWT weighing module is designed to be installed on an Ethernet backplane in the main remote rack. The adapter supports the Modicon X80 I/O and partner modules with Ethernet. The bus connector is shown in items 1 below.

The adapter also has a keying pin (item 2 below) to keep it from being installed on a BMX BKP.xxxx backplane.

Rear view of the adapter module:



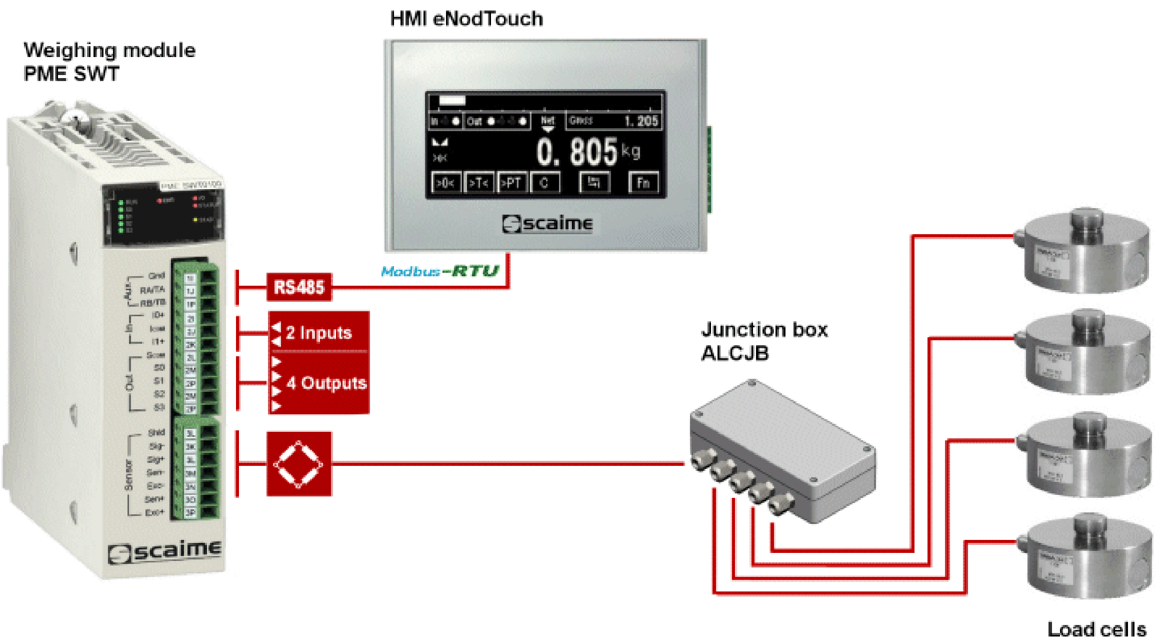
- 1. Ethernet backplane connector
- 2. Keying pin

10. Interfaces

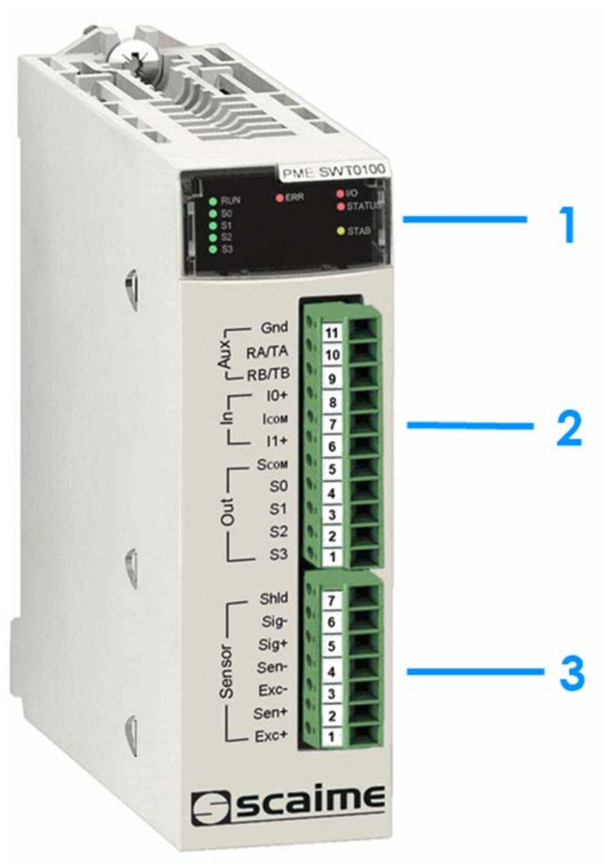
The primary task of PME SWT is the measurement of the current weight value thru one input load cell channel. This channel is pre-adjusted in the factory. This makes possible the theoretical adjustment of the scale without adjustment weights as well as module replacement without a new adjustment of the scale.

PMESWT possesses one RS485 port for the connection of local tactile HMI for weight display and weighing function operations.

PMESWT also integrates two digital inputs for weighing function triggering and four programmable digital outputs dedicated to weight level monitoring and dosing control.



10.1.1. Connection



1 *LED display*

2 *Connector* ***Flat Screw driver***

3 *Connector* ***Tightening torque: 0.22 -> 0.25 Nm***

The following table describes the front connection of the PME SWT 0100.

Connector	PIN number	Labelling	Description		
3	*11*	*RB/TB*	*RS485 data cable TB*		*RS485*
	10	*RA/TA*	*RS485 data cable TA*		
	9	*GND*	*RS485 data cable GND*		
	8	*I0+*	*Digital input 0*	*+24 Vdc, 7 mA nominal*	*Input*
	7	I_{COM}	*Digital Input common*		
	6	*I1+*	*Digital input 1*	*+24 Vdc, 7 mA nominal*	
	5	S_{COM}	*Digital Output Common*		*Output*
2	*4*	*S0*	*Digital output 0*	*±24 Vdc, 250 mA nominal*	
	3	*S1*	*Digital output 1*	*±24 Vdc, 250 mA nominal*	
	2	*S2*	*Digital output 2*	*±24 Vdc, 250 mA nominal*	
	1	*S3*	*Digital output 3*	*±24 Vdc, 250 mA nominal*	
	7	*Shld*	*Shield*		*Load cell*
	6	*Sig-*	*Measurement cable load cell -*		
	5	*Sig+*	*Measurement cable load cell +*		
	4	*Sen-*	*Sensor cable load cell -*		
	3	*Exc-*	*Supply load cell -*		
	2	*Sen+*	*Sensor cable load cell +*		
	1	*Exc+*	*Supply load cell +*		

10.2. Load cells input

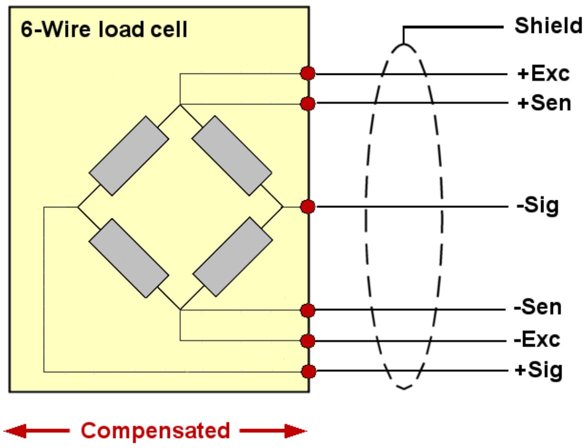
4 or 6-wire strain gauges sensors with sensitivity from 0.1 mV/V to 6 mV/V

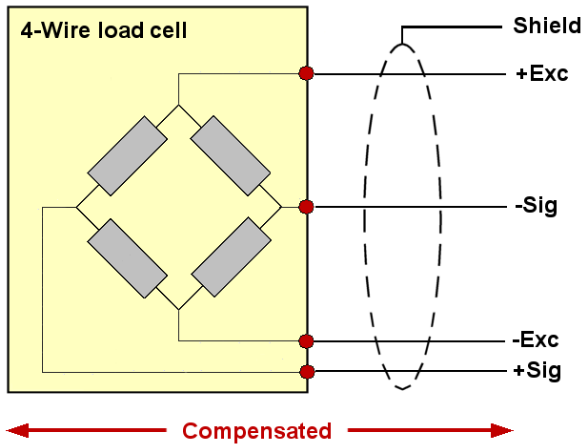
10.2.1. 4 and 6-wire load cells

In a 4-wire load cell, the cable is part of the temperature compensating system of the load cell. The load cell is calibrated and compensated with a certain amount of cable attached.

In a 6-wire load cell, the cable is not part of the temperature compensating system of the load cell. 2 sense lines are connected to the controller which adjusts its output voltage to compensate for any resistance change in the cable. The advantage of using this system is the possibility to cut the 6-wire load cell cable to any length.

Parameter	*Possible Value*	*Default*	*Description*
Load Cell Mode	*4/6 wires*	*4 wires*	*Must be compliant with the type of connector connected to the PME SWT: 4 or 6 wires.*





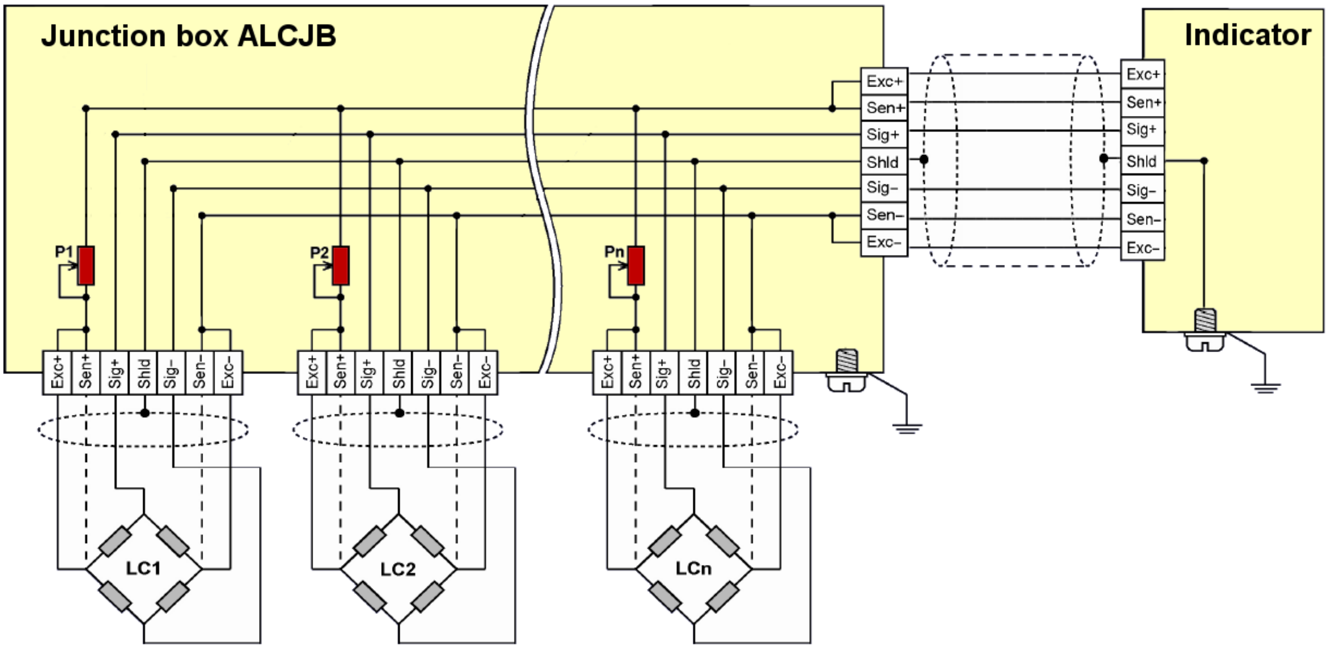
10.2.2. Multiple load cells connection

In multiple load cell weighing systems, load cells can be wired in parallel by joining the load cell cable core ends of the same color. For this, SCAIME provides ALCJB junction boxes. The output signal is then the average of the individual output signals.

CAUTION
In case of multiple load cells connection, PME SWT can supply excitation voltage to a maximum of 8 load cells (350 Ω output resistance)

Sometimes it is necessary to trim the output of each individual load cell to avoid corner load differences, which are caused by difference in load cells output resistance or unequal load distribution.

Trimming can be done by adjusting variable resistors (P1…Pn) placed into the excitation paths of the ALCJB.



10.2.3. Cable extension

Extension cables must be shielded and of low capacitance. We recommend the use of SCAIME cables, which satisfy these requirements. To compensate the effects of resistance changes in the extension cable, a 6-wire extension cable must be used

CAUTION

- ***The wiring distance between load cells and the module should not exceed 300m***
- ***Load cell cables should be kept away from power circuits, with a minimum of 1m.***
- ***Power supply cables should be crossed at right angles.***

10.3. Auxiliary RS485 communication port

The PME SWT module offers a serial link to carry over the weight to an external dedicated display panel:

- Non-isolated half-duplex RS485, 2-wire connection
- Fixed format : 1 start bit, 8 data bits and 2 stop bits
- Maximum connection distance 30m
- A jumper allows activating an internal termination resistor.
- The transmission lines are polarized with a 1,5 kΩ resistor.
- Communication protocol is Modbus-RTU and PME SWT is a slave device

The parameters linked to this auxiliary port are the following:

Parameter	Possible Value	Default	Description
RS485 resistor option	*ON / OFF*	*OFF*	*Line termination resistor for RS485 HMI line*
Address HMI	*1 to 128*	*1*	*PME SWT slave N° on the Modbus network*
Baud rate HMI	*9,6 to 115,2Kbds*	*9,6Kbds*	*Communication rate of auxiliary RS485 port*
HMI Language	*FR / ENG*	*ENG*	*Language of HMI menu*
HMI keyboard visibility	*Yes / No*	*No*	*Enable/disable the HMI functions keys*
HMI Password activation	*Yes / No*	*No*	*Enable/disable password for HMI setup access*
Password	*4 visible characters*	*"5555"*	*Password value for HMI setup access*

All Modbus-RTU Master can be connected to the weighing module to:

- Read PME SWT process data: Gross/Net weight, Flow rate, Measurement status, Input/output status
- Send weighing function commands to the PME SWT module: Zero, Tare, or Calibration…

10.3.1. eNodTouch display panel

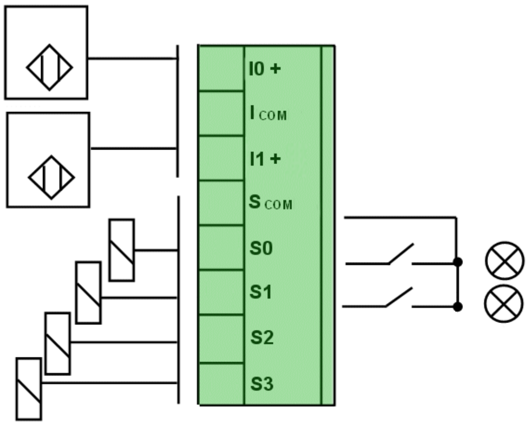
SCAIME can provide **eNodTouch**, a compact graphic operator interface with the following specifications:

Display type	*Back lighted 3.4" STN Monochrome LCD*
Resolution	*W200 x H80 pixels*
Touch Panel type	*Resistive film*
Input voltage	*24VDC, 3.0W*
Dimension	*W116.5 x H77.5 x D28mm*

10.4. Discrete Input/output

The PME SWT is equipped of 2 discrete inputs and 4 discrete outputs used to trigger actions. They are connected using a screw terminal block.

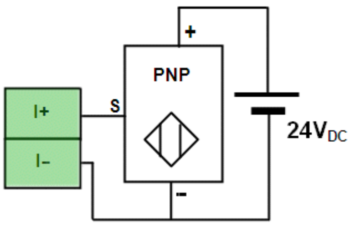
Input / output connections:

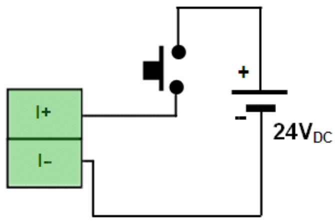


10.4.1. Discrete inputs

PME SWT has 2 opto-isolated digital inputs with the following specifications:

Examples of detector and push-button wiring





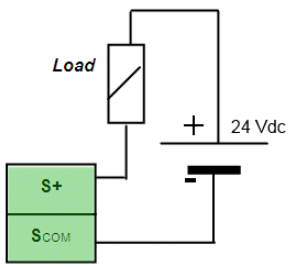
Each input can be individually set to positive or negative logic and can be assigned to trigger a weighing function.

10.4.2. Discrete outputs

The PME SWT has 4 opto-insulated digital outputs (Static relays) with the following specifications:

Weighing module discrete outputs are used to trigger actions on threshold crossings. Each output can be individually set to positive or negative logic.

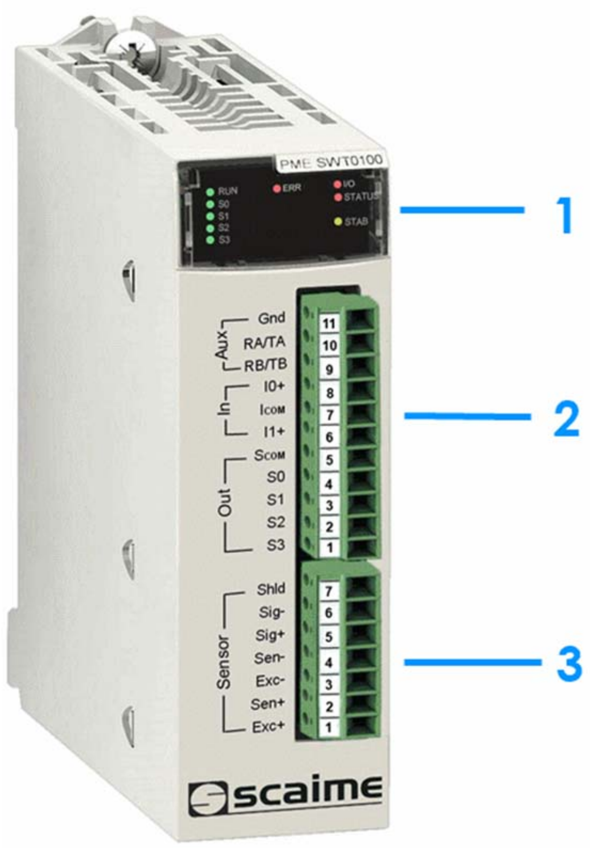
Examples of output wiring



Weighing module discrete outputs are used to trigger actions on threshold crossings. Each output can be individually set to positive or negative logic.

10.5. LED Indicators

The PME SWT weighing module is fitted with LEDs which display the status of the module. The following diagram shows the weighing module display screen:



1 LED display

2 Connector

3 Connector

The various possible faults are grouped in the following table:

LED	Continually lit	Flickering, Flashing, or Blinking	OFF
RUN (Green)	*Normal operation*	*Flickering: Firmware upgrade in progress*	*Module faulty, switched OFF or starting up*
ERR (Red)	*Critical error, or not valid MAC address, or no Ethernet link*	*Flashing: Communication to PAC lost Blinking: No IP address (2x); Invalid configuration (3x); Duplicate IP address (4x); awaiting served IP address (5x); Invalid IP address (6x); Error on the daughter board (7x)*	*Module starting up, or no runtime error*
STATUS (Green)	*User calibrated*	*Calibration in progress*	*Factory calibrated*
STATUS (Red)	*- Converter saturation - No communication with Converter - EEPROM memory corruption*	*Measurement Out of range*	*No error*
STAB (Yellow)	*Instability*	-	*Stable Measurement stable or instability not defined*
S0 (Green)	*S0 digital output ON*	-	*S0 digital output OFF*
S1 (Green)	*S1 digital output ON*	-	*S1 digital output OFF*
S2 (Green)	*S2 digital output ON*	-	*S2 digital output OFF*

11. Identification parameters

Read Only Parameter	Possible Value	Description
Application software version	*1.xx.yy*	*Version number of the applicative software part*
Legal software version	*0 to 255*	*Version number of the Legal for trade software part*
Boot loader version	*0.xx.yy*	*Version number of the Boot loader software*

12. Scaling parameters

Parameter	Possible Value	Default	Description
maximum capacity	*1 to 1 000 000*	*500 000*	*Maximum weight that it is possible to weigh, without dead weight of the empty receiver.*
scale interval	*1, 2, 5, 10, 20, 50*	*1*	*The 'scale interval' is the minimal difference between two consecutive indicated values.*
Decimal point position	*0 to 7*	*0*	*Number of digits after the decimal point.*
unit	*4 visible char.*	*" kg "*	*Weight measurement unit (mg, g, kg, t, lb…)*

12.1.1. Maximum capacity

The *'maximum capacity'* stands for the maximum sensor/load cell signal range. When the absolute value of the gross measurement exceeds its value plus 9 divisions, the b_3 bit (positive overloading) or the b_2 bit (negative overloading) of the measurement status is set to 1 (it can activate a logical output if it is assigned to the *'defective measurement'* function).

The zero acquisition (on request or at power-up) is done only if the gross measurement value is contained between a ±10% range of the *'maximum capacity'* (±2% if the *legal for trade* option is active).

The *'maximum capacity'* setting also allows calibrating ***PME SWT*** in case of a theoretical calibration in association with the sensor sensitivity. Measurement scaling will be automatically adapted so as to deliver a gross measurement value equivalent to the *'maximum capacity'* for an analog signal corresponding to the sensor sensitivity.

After a theoretical calibration, the maximum capacity can be changed to fit to the application.

12.1.1. Decimal point position

Although ***PME SWT*** measurements are integer values it is however possible to store a '*decimal point position'* so as to design a display related to the application. Its value represents the number of decimal digits. If the variable is set to Zero, it means that decimal point is not used.

Note: the decimal point is directly integrated to SCMBus protocol frames (see § SCMBus).

13. Metrological parameters

Parameter	Possible Value	Default	Description
Load Cell Mode	*4/6 wires*	*4 wires*	*Must be compliant with the type of connector connected to the PME SWT: 4 or 6 wires.*
Zero Tracking	*Yes / No*	*No*	*Enable the Zero tracking function*
Initial Zero	*Yes / No*	*No*	*Enable the Zeroing at power-on.*
stability criterion	*Disable, 0.25, 0.5, 1, 2d*	*0.25d*	*Defines a stability interval, related to scale interval.* *A measurement is stable if X (depending on A/D conversion rate) consecutive measurements are included in the stability interval.*
Zero/Tare specified time	*0 to 65535 ms*	*100 ms*	*Use in dynamic application where stability could not reached.* *It's the maximum time in which stability is searched for taking "Zero/Tare in specified time". If after that time, there is no stability, a special Zero/Tare calculation is operated.*
Preset Tare value	*0 to Max. capacity*	*0*	*Used to manually introduce a Tare value. A previous calculated tare can be restored using this variable.*

13.1.1. Zero Tracking and Initial Zero

The zero tracking and the initial zero setting can be respectively enabled by setting b_0 bit or b_1 bit to 1. When activated, both options are effective on a ±10% range of the *'maximum capacity'* (±2% if the *'legal for trade mode'* is enabled).

13.1.2. Stability criterion

The stability criterion defines the interval on which measurements are considered as stable. Motion is indicated by the measurement status. A measurement is stable if consecutive measurements following the reference measurement are included in the stability interval (see following table) else the current measurement becomes the new reference measurement.

A/D conversion rate (meas/s)		*Number of values used to consider stable measurement*
50-Hz rejection	*60-Hz rejection*	
6,25	*7,5*	*1*
12,5	*15*	*2*
25	*30*	*3*
50	*60*	*5*
100	*120*	*9*
200	*240*	*17*
400	*480*	*33*
800	*960*	*65*
1600	*1920*	*129*

14. Flow control parameters

The PME SWT module calculates the flow rate using the following parameters

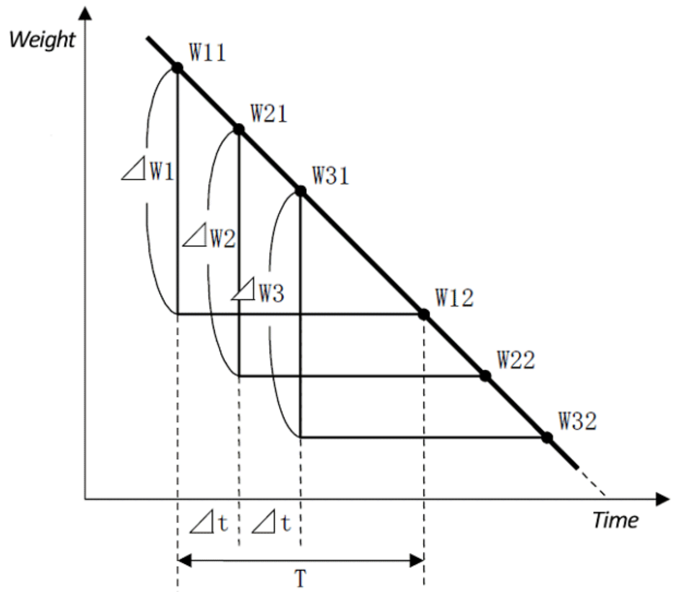
Parameter	Possible Value	Default	Description
Flow filter depth	*2, 4, 8, 16, 32, 64, 128*	*N = 8*	*The filtered flow is the sliding average of N instantaneous flow calculated at each measurement acquisition (Net weight).*
Flow Time unit	*h, mn, s*	*s*	*Used for flow rate scaling in weight unit/time unit*

Current Flow rate : F = (f1+f2 … +fn) / N

with

- fi : Instantaneous flow rate : fi = ΔWi / T
- ΔWi : Net weight variation during time T
- T : Flow calculation time : This calculation time depend on the parameters N and Δt
- Δt: Weight sampling time, depend on A/D converter rate.
- N : Flow filter depth

By using this calculation: The first flow value is available from the time T of flow calculation. After time T, the flow rate is recalculated at each measurement.



15. Process Data parameters

The table below shows the implicit exchange objects which apply to the PME SWT.

15.1.1. Measurement variables

Object	Description
Gross Measurement	*the 'gross measurement' stands for the digital value after measurement scaling. It is affected by all the 'zero' functions*
Tare Value	*the 'tare measurement' stores the calibrated value which is subtracted from the 'gross measurement' to give the 'netmeasurement'.*
Net Measurement	*the 'net measurement' stands for the digital value after measurement scaling and tare subtraction.*
Factory calibrated points	*the 'factory calibrated points' contains the measurement value without the user calibration layer. That means it is directly linked to the analog input voltage*
Flow rate	*Flow rate*

15.1.1. Measurement status

Status indicator	Possible Values	Description
A/D error	*0, 1,2,3*	*A/D Error = 0 -> No A/D converter error* *A/D Error = 1 -> Gross measurement < - Max. capacity.* *A/D Error = 2 -> Gross measurement > Max. capacity.* *A/D Error = 3 -> No communication with the converter or Converter out of range*
Stability	*TRUE/FALSE*	*Indicate that measurement is stable according to the statibity criterium*
Measurement out of ¼ division	*TRUE/FALSE*	*Indicate measurement is Zero in the ¼ of division (OIML indicator)*
EEPROM failure / corrupt	*TRUE/FALSE*	*Error with internal memory of the PME SWT*
Tare / Zero running	*TRUE/FALSE*	*Tare or Zero has been processing*
Tare has been processed	*TRUE/FALSE*	*A tare has been processed on the PME SWTand is applied to the measurement*
Calibration has been processed	*0 to 7*	*A calibration has been processed on the PME SWTand is applied to the measurement:*
Running calibration type		
Preset Tare status	*TRUE/FALSE*	*A preset tare device was engaged*

15.1.2. I/O status

Status indicator (1/0)	Description
I0, I1	*the 'I/O level' object allows reading any time PME SWT discrete inputs and outputs level.* *S0 and S1 level cause corresponding S0 and S1 led update*
S0, S1, S2, S3	

16. Functional commands

PME SWT is able to handle several functional commands thanks to a couple of registers:

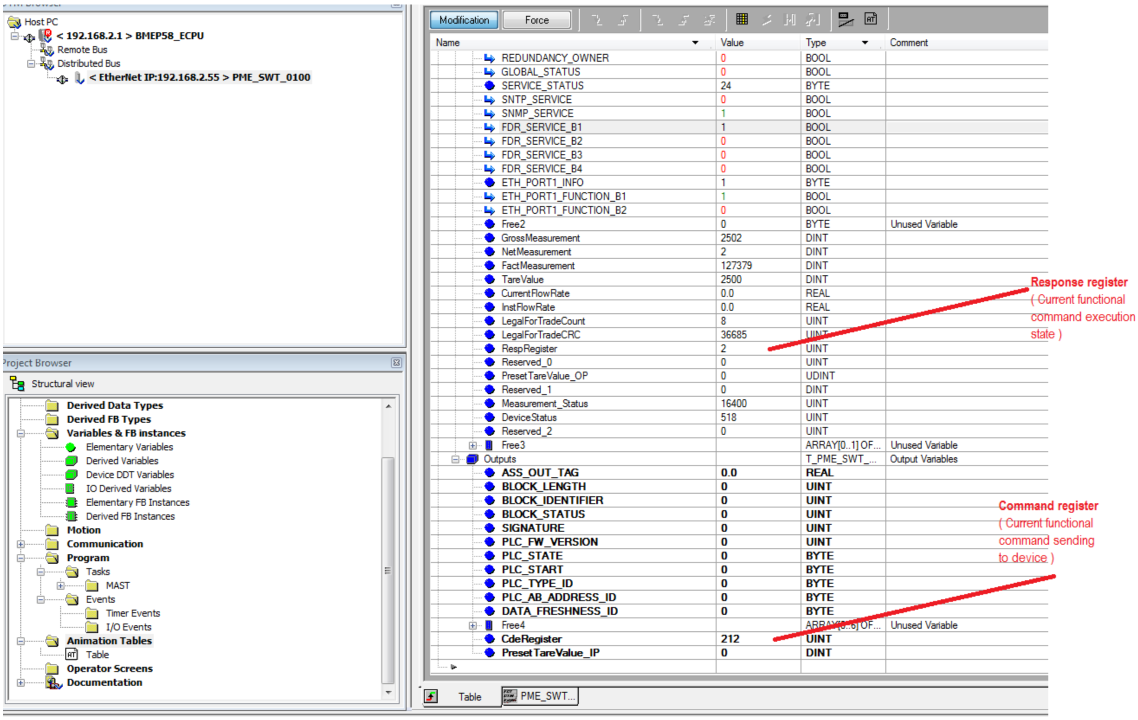
- the command register : dedicated to accept the functional commands
- the response register : gives the state of the command currently being processed by PME SWT

The following tables show the functional commands available for the weighing module:

16.1. Sending Functional Commands through Unity

The weighing module is able to handle several functional commands codes from user application. To achieve a command, user has to write specific code into device ***"Command Register".*** Device replies to user functional command through ***"Response Register".***

Command and response registers are available on unity in IO scanning connection (see in capture below an example of Unity animation table).



User functional commands supported by the weighing module are:

Command Name	Code	Description	Note
Clearing functional registers	***00_H***	*Causes Command and Response registers to be set to 0.*	*It is recommended to send this command before sending any functional commands*
Device reset	***$D0_H$***		
Saving on Flash Memory	***$D1_H$***		
Restore to factory setting	***$D2_H$***	*Device will lose its current configuration (calibration etc.)*	
Zero	***$D3_H$***	*Set to 0 Gross and Net Measurements (if stability reached in 5s)*	
Tare	***$D4_H$***	*Set to 0 Net Measurement (if stability reached in 5s)*	
Cancel tare	***$D5_H$***	*Set to 0 Tare value*	
Cancel current command	***$D6_H$***	*Ended current command*	
Theoretical scaling	***$D7_H$***	*Device theoretical calibration with known sensitivity value at max capacity*	
Zero adjustment	***$D8_H$***	*Set current load as device zero reference*	
Start physical calibration process	***$D9_H$***	*Put device in to physical calibration mode*	
Calibration zero acquisition	***DA_H***	*Set current load as device zero reference(if stability in 10s)*	*Possible if device is previously putted into calibration mode*
Segment 1 acquisition	***DB_H***	*(if stability reached in 10s)*	*Possible if Zero step success*
Segment 2 acquisition	***DC_H***	*(if stability reached in 10s)*	*Possible if Segment 1 step success*
Segment 3 acquisition	***DD_H***	*(if stability reached in 10s)*	*Possible if Segment 2 step success*
Saving Calibration on Flash Memory	***DE_H***		*Possible if all calibrations step success*
Theoretical zero	***$E3_H$***	*Device theoretical calibration with known sensitivity value at dead load*	
Span adjustment	***$E4_H$***		
Pre-set tare	***$E5_H$***	*Manually set current tare weight with user preference value defined in **PresetTareValue_IP** parameter*	
Zero in specified time	***$E6_H$***	*Set to 0 Gross and Net Measurements(even if not stability)*	
Tare in specified time	***$E7_H$***	*Set to 0 Net Measurement (even if not stability)*	

16.2. Device Response Register Status

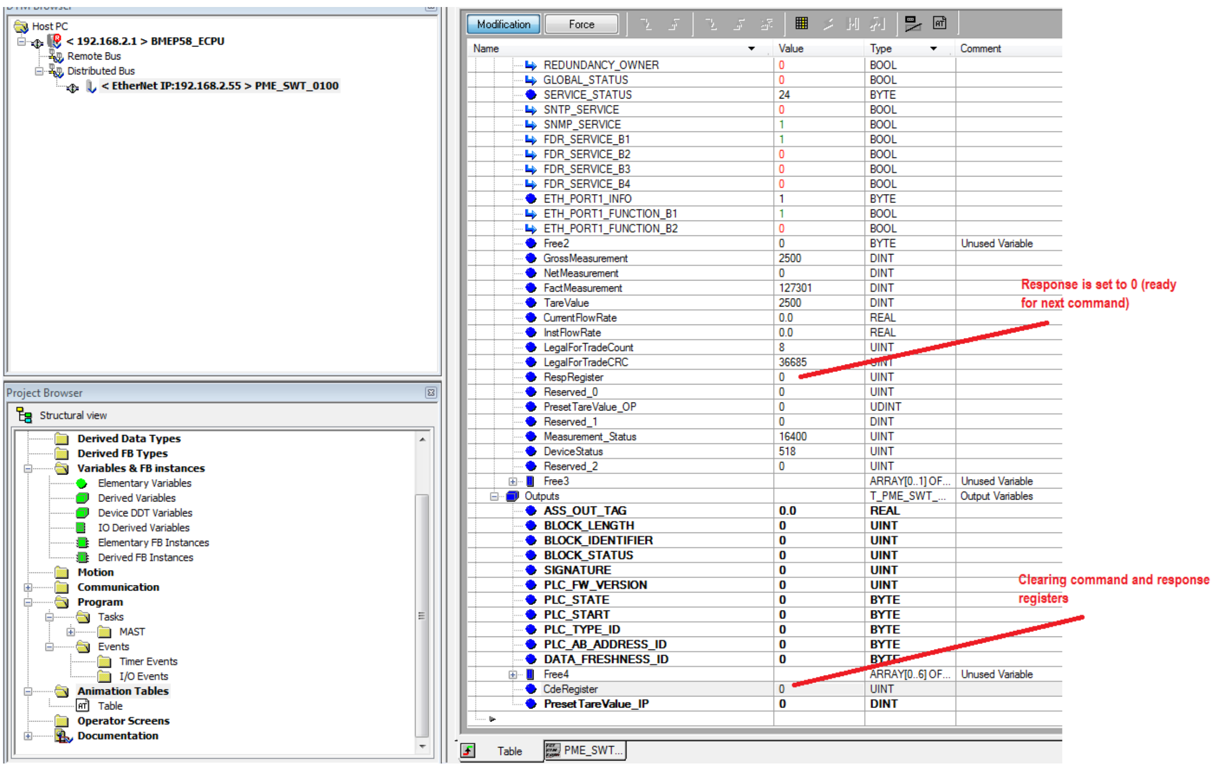
The ***"RespResponse"*** parameter gives the status of the functional command currently being processed by the weighing module. It is automatically updated by the device if value of ***"CdeRegister"*** parameter has changed such as new command received.

Followings are the response register status which could be reported to user by the weighing module:

Response Register Status	*Description*
00_H	*Device is free/ready to accept a new command from user*
01_H	*Current command execution is in progress*
02_H	*Current command execution is complete (Successfully)*
03_H	*Current command execution is complete (Failure)*

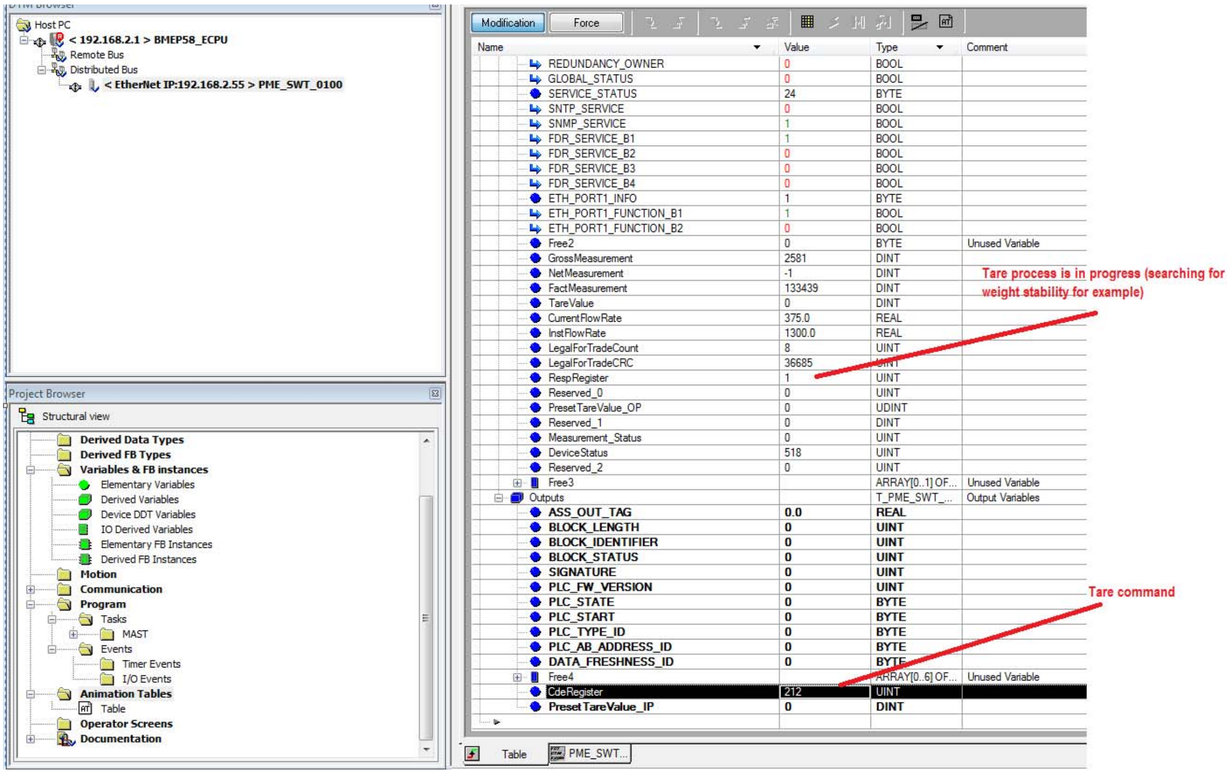
- # Step 1:

Preparing device to receive a new command



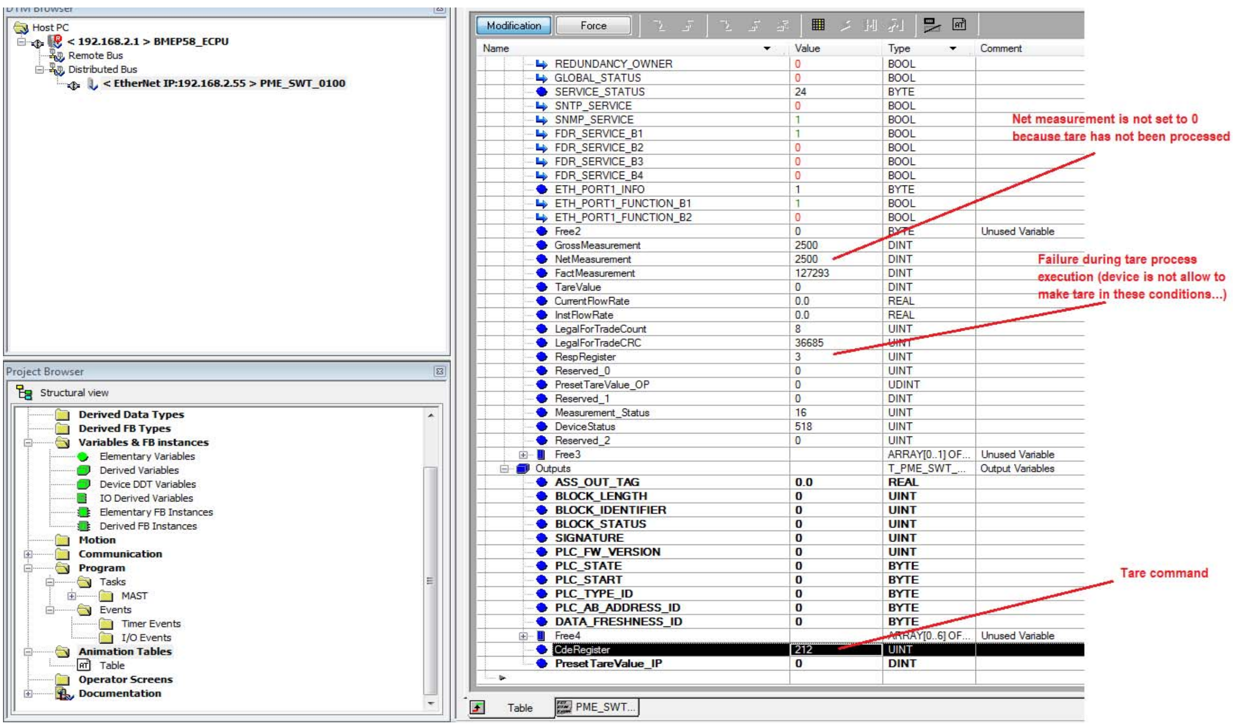
- # Step 2:

Sending the functional command code to the module, **Example:** Tare = $D4_H$ = 212_d



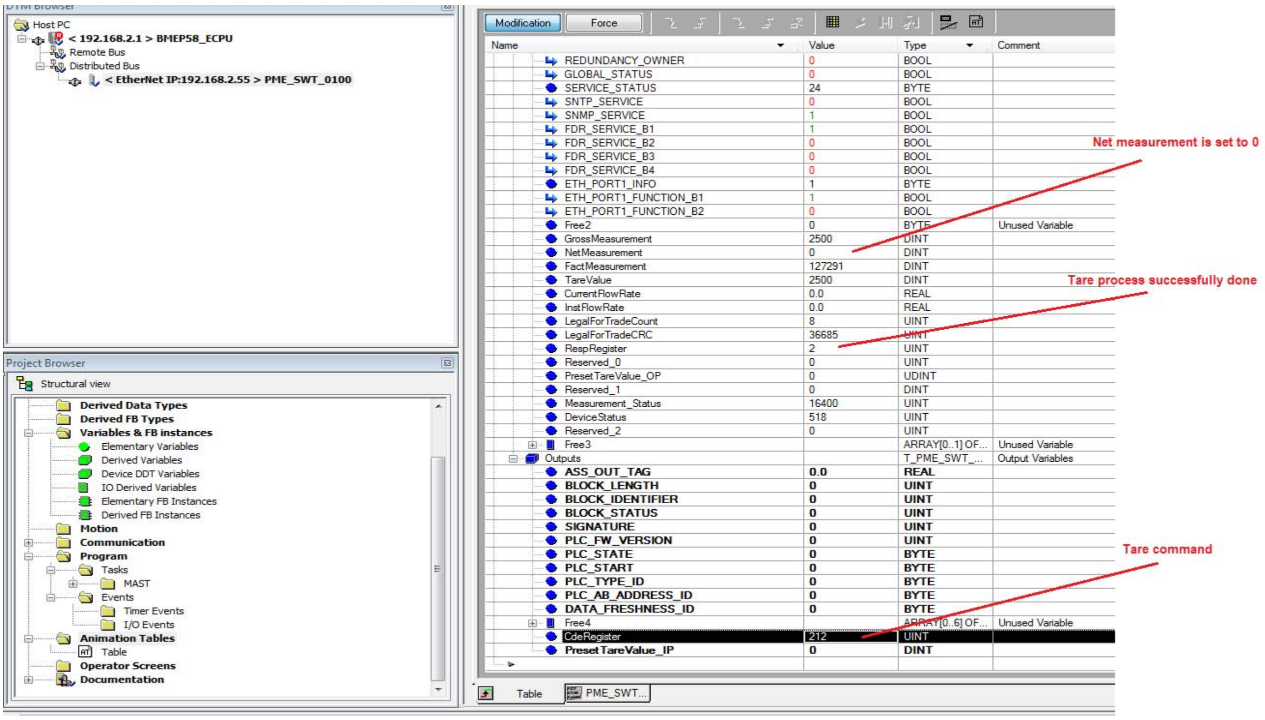
- # Step 3:

In case of failure during functional command execution



- # Step 4:

Functional command execution is complete successfully


Net measurement is set to 0
Tare process successfully done
Tare command

16.3. Example with Pre-set Tare Parameter

On following screen shot example, both device real time output parameters are using to perform preset tare action.

- # Step 1:

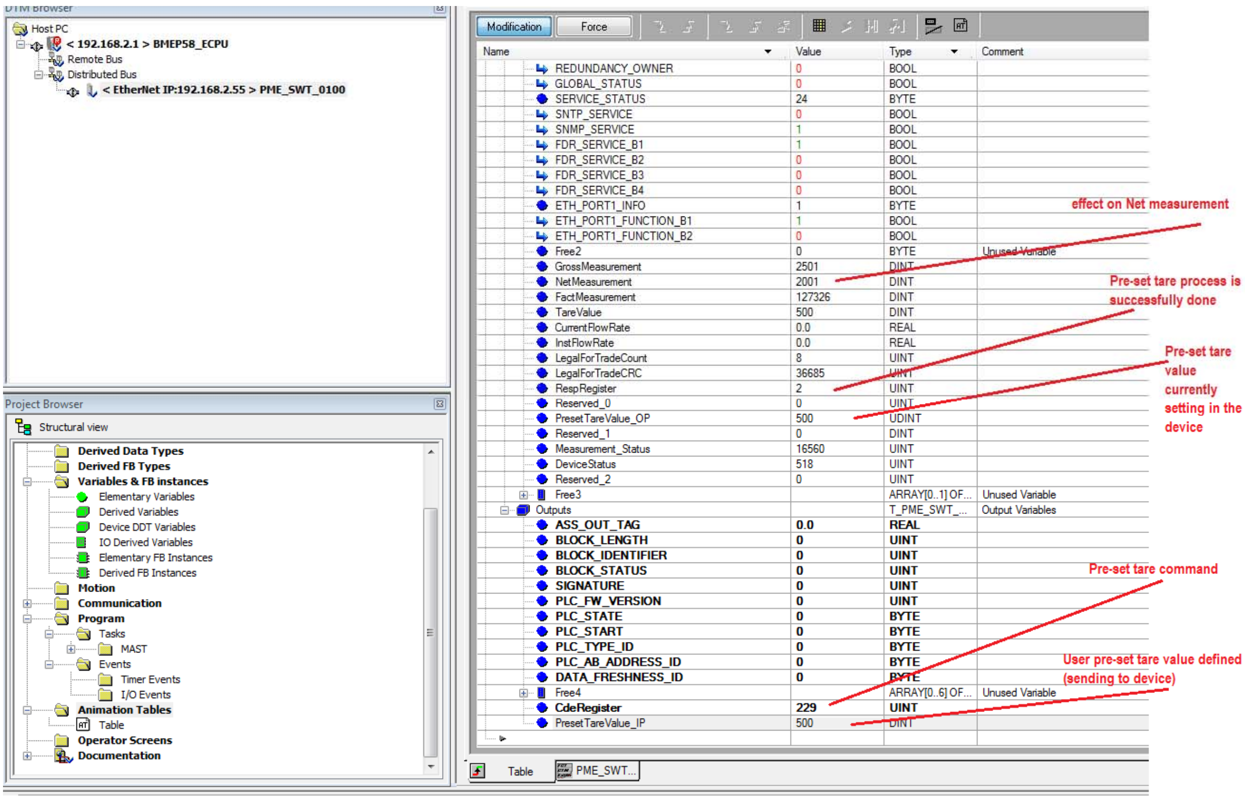
Write user preference pre-set tare value to the device

- # Step 2:

Send user pre-set tare command code to the device

- # Step 3:

Observe device response and pre-set tare effect on Net Measurement value



16.4. System commands

Command	Parameters	Description
Reset	-	*Software Reboot*
EEPROM backup	-	*PME SWT configuration and calibration are stored in a non-volatile memory (EEPROM). If changes are made in the device configuration, sending to PME SWT the 'EEPROM backup' functional command will allow to keep these modifications after a power shutdown*
Restore default settings	-	*Causes PME SWT to be set back to its default factory settings, including calibration parameters.*
Cancel command	-	*Cancel process command (calibration, tare…)*

16.4.1. Reset

This reboot phase is necessary if the external HMI address or/and the baud rate are modified and some settings changes are only taken into account after an EEPROM storage followed by a reset.

16.4.2. EEPROM backup

PME SWT configuration and calibration are stored in a non-volatile memory (EEPROM). If changes are made in the device configuration, sending to ***PME SWT*** the *'EEPROM storage'* functional command will allow ***PME SWT*** to keep these modifications after a power shutdown or the reception a *'reset'* functional command.

Moreover the settings listed below need to be stored and will only be taken into account at the next device reboot:

- Global span adjusting coefficient
- calibration place g value
- place of use g value
- stability criterion
- legal for trade mode
- Initial zero
- A/D conversion rate

16.4.3. Restore default settings

The *'restore default settings'* command causes ***PME SWT*** to be set back to its default configuration. The default configuration corresponds to the one on delivery that means with factory settings. Be careful when using this command, all the default settings are recovered including the stored calibration and the legal for trade indicators.

16.5. Weighing control commands

Command	Parameters	Description
Zero	-	*PME SWT acquires a volatile zero (gross measurement is set to 0) if the following conditions are respected :* *measurement is stable* *Gross measurement is within a ±10% (±2% if "legal" is enabled) range of the 'maximum capacity'.* *Otherwise, after 5s, the command is cancelled and error is reported.*
Tare	-	*PME SWT acquires a volatile tare (net measurement is set to 0) value if the measurement is stable otherwise, after 5s, the command is cancelled and an error is reported*
Zero in specified time	*Zero/Tare specified time*	*Use in dynamic application where stability could not reached.* *The stability condition is replace by a maximum time in which stability is searched for taking Zero or Tare. If after that time, there is no stability, a special Zero/Tare calculation is operated.*
Tare in specified time		
Preset Tare	*Preset Tare value*	*With this command it is possible to retrieve a defined tare value. Net measurement is set to Gross minus Preset tare.*
Cancel Tare	-	*Erases the current tare value*

16.5.1. Zero

When receiving a *'zero'* functional command***, PME SWT*** acquires a volatile zero (gross measurement is set to 0) value if the following conditions are respected:

- measurement is stable
- Current gross measurement is within a ±10% (±2% if the legal for trade option is enabled) range of the *'maximum capacity'*.

Otherwise, after 5 seconds the command is cancelled and an execution error is reported.

16.5.2. Tare

When receiving a *'tare'* functional command***, PME SWT*** acquires a volatile tare (net measurement is set to 0) value if the measurement is stable otherwise, after 5 seconds the command is cancelled and an execution error is reported (see *'measurement status'*).

16.5.3. Cancel tare

This command erases the current tare value if at least one tare has been previously processed.

16.5.4. Cancel last command

This command sets the response register to **00_H** and allows ***PME SWT*** to ignore the functional command previously received (for example to exit a sequential procedure like a physical calibration).

16.5.5. Logical outputs 1-4 activation/deactivation

If the corresponding logical outputs are assigned to the *'level on request'* function, they can be enabled/disabled by transmitting one of these functional commands. Upon first reception, the corresponding output is enabled and on next reception it will be disabled. If the requesting logical output is assigned to the wrong function, ***PME SWT*** reports an error.

17. Filters

17.1.1. Introduction

The PME SWT module is equipped with a high performance **24 bit A/D converter** with high speed carrier frequency of **3840 Hz** for an Input load cell signal range of **±7.8 mV/V**.

There are 2 available filtering levels which can be associated:

- Bessel low-pass filter
- Mean value filter

Except for the A/D conversion rate that is always enabled, none of these filters is mandatory. However, to perform accurate measurements we recommend setting a combination of filters.

17.1.2. Bessel low-pass filter parameters

Parameter	Possible Value	Default
Low pass Order	Disable, 2, 3, 4	3
Low pass Cut-Off frequency	0.10 Hz to 200 Hz	5 Hz

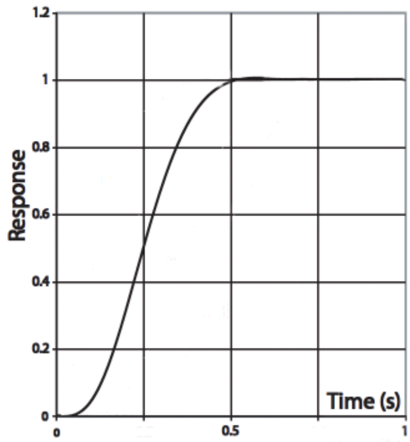
For the suppression of periodic vibrations, a Bessel low-pass digital filter can be applied as an output of the A/D converter.

The minimum value for cut-off frequency depend on the A/D converter rate:

0.10 Hz for 6.25 meas/s converter rate

4 Hz for 400 meas/s converter rate

The specification of the cut-off frequency has a decisive significance for the suppression of periodic interferences. The response time of the weighing system to the change of the measured value is determined by the cut-off frequency.



Step response of 4^{th} order Bessel, with Fc=2 Hz

17.1.1. Mean-value filter

The Mean-value filter is used to calm the weight value when there are random interferences.

Parameter	Possible Value	Default	Description
Mean Filter depth	*Disable, 2, 4, 8, 16, 32, 64, 128*	*Disable*	*A sliding average, where the result is the average of the last n measurements (n= depth) can be applied as an output of the Bessel filter.*

17.1.2. A/D converter parameters

The signal resolution is related to the conversion rate. The conversion rate might be chosen as low as possible, particularly for static applications. For dynamic applications, a compromise must be found between the measurement rate and the low-pass filter cut-off frequency. Choose a measurement rate that rejects the mains frequency harmonics according to the place of use, 50 or 60Hz.

Parameter	Possible Value		Default	Description	
A/D Frequency rejection	*50 Hz, 60 Hz*		*50 Hz*	*The A/D converter have In-built adjustable low-pass filter with frequency rejection of 50 Hz or 60 Hz harmonics.*	
A/D conversion rate	***50 Hz***	***60 Hz***	*100 Hz*	***Resol.***	*Filtered measurement frequency is adjustable from 6.25 to 480 Hz* *The following table shows the Noise-free resolution, related to the conversion rate.*
	6.25 Hz	*7.5 Hz*		*19 bits*	
	12.5 Hz	*15 Hz*		*19 bits*	
	25 Hz	*30 Hz*		*18 bits*	
	50 Hz	*60 Hz*		*18 bits*	
	100 Hz	*120 Hz*		*17 bits*	
	200 Hz	*240 Hz*		*16 bits*	
	400 Hz	*480 Hz*		*16 bits*	

To reach an accurate and stable measurement:

- In static applications, the conversion rate might be chosen as low as possible.
- In dynamic applications, the use of post-filters allows the suppression of periodic or random interferences to increase the speed/precision performance of weighing

Note: To be applied, any modification of this setting must be followed by an EEPROM back up and device reboots (hardware or software).

Note: Recursive filters like ***PME SWT*** low-pass filters are computed according to the filter order, the desired cut-off frequency and the sampling rate. There are some limitations to respect in order to ensure a safe functioning of the signal processing. They are listed in the table below:

A/D conversion rate (meas/s)	*min low-pass cut-off frequency (Hz)*		*A/D conversion rate (meas/s)*	*min low-pass cut-off frequency (Hz)*	
50 Hz rejection			***60 Hz rejection***		
	2nd order	***3rd order***		***2nd order***	***3rd order***
6.25	*0.10*	*0.10*	***7.5***	*0.10*	*0.10*
12.5	*0.10*	*0.10*	***15***	*0.10*	*0.15*
25	*0.10*	*0.15*	***30***	*0.15*	*0.20*
50	*0.15*	*0.25*	***60***	*0.20*	*0.30*
100	*0.25*	*0.50*	***120***	*0.30*	*0.60*
200	*0.50*	*1.00*	***240***	*0.60*	*1.20*
400	*1.00*	*2.00*	***480***	*1.20*	*2.40*
800	*2.00*	*4.00*	***960***	*2.40*	*4.80*
1600	*4.00*	*8.00*	***1920***	*4.80*	*9.60*

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18. Discrete Input parameters

Each discrete input can be individually set according to the following parameters.

Parameter	Possible Value	Default	Description
I0 functioning ***I1 functioning***	*None*	*I0: Zero* *I1: Tare*	*the input has no function*
	Zero		*See related command*
	Tare		
	Zero in specified time		
	Tare in specified time		
	Cancel Tare		
	Test		*Special mode for module testing*
	Start Dosing process		
I0 logic ***I1 logic***	*Positive, Negative*	*Positive*	*defines the edge (or level) that triggers input function*
Inputs Holding time	*0 to 65535 ms*	*100 ms*	*Minimum required stabilization time of the logical inputs before their activation*

19. Discrete Output parameters

Weighing module discrete outputs are used to trigger actions on threshold crossings. Each output can be individually set to positive or negative logic

The functions assigned to these outputs are separated in two groups:

- S0 and S1 outputs are used to control threshold crossing for 2-feed dosing control
- S2 and S3 output are freely configurable on measurement threshold monitoring

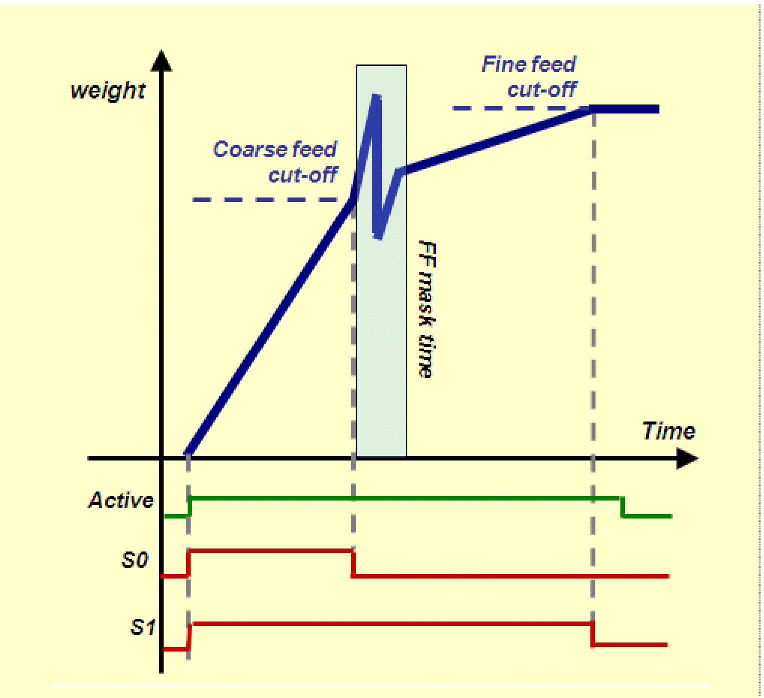
19.1.1. S0 and S1 output parameters

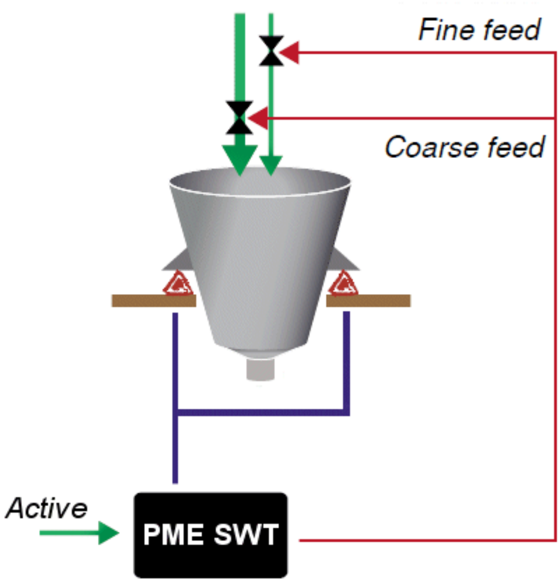
- The Coarse Feed (CF) cut-off point is associated with output S0,
- The Fine Feed (FF) cut-off point is associated with output S1.

The threshold check manages the outputs according to the following parameters:

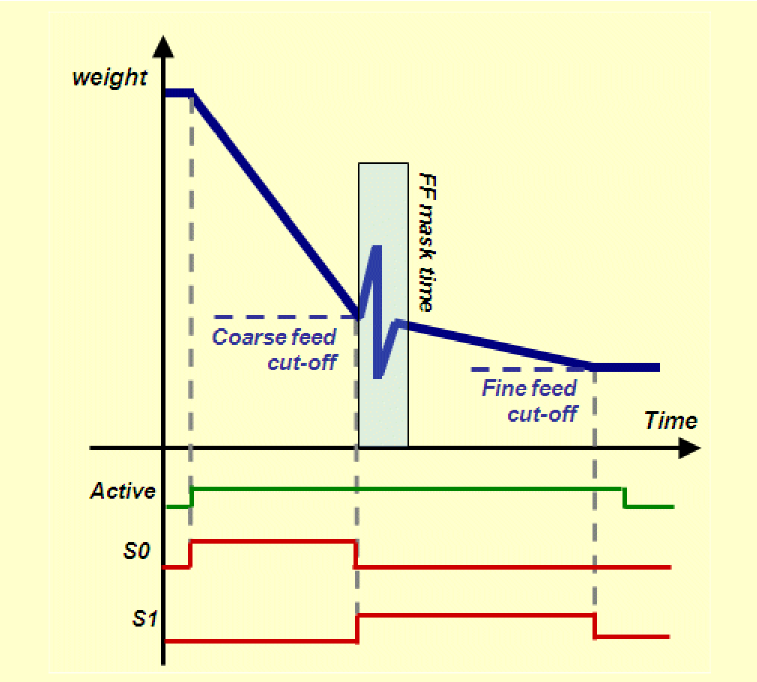
Parameter	*Possible Value*	*Default*	*Description*
S0 & S1 Activation	*Enabled, disabled*	*disabled*	*Enable or disable the output management.*
S0 & S1 logic	*Positive, negative*	*Positive*	*defines the edge (or level) that triggers outputs function*
S0 & S1 Direction	*Filling, Unloading*	*Filling*	*Corresponds to the direction in which the thresholds are recognized*
S0 & S1 Coarse Feed mode	*S0, S0+S1*	*S0*	*Concerns the coarse feed phase: Only S0 output, or S0 and S1 at the same time.*
S0 & S1 Comparison Source	*Net, Gross*	*Net*	*Define which value is checked with cut-off values*
Coarse Feed Cut-off point	*0 to Max Capacity*	*0*	*Depending on the direction defined, S0 and S1 outputs go to zero when these thresholds are met.*
Fine Feed Cut-off point	*0 to Max capacity*	*0*	
Fine Feed mask time	*0 to 65535 ms*	*0*	*It defines the time after the CF, during which the module no longer checks the weight, to mask perturbations at feed change.*

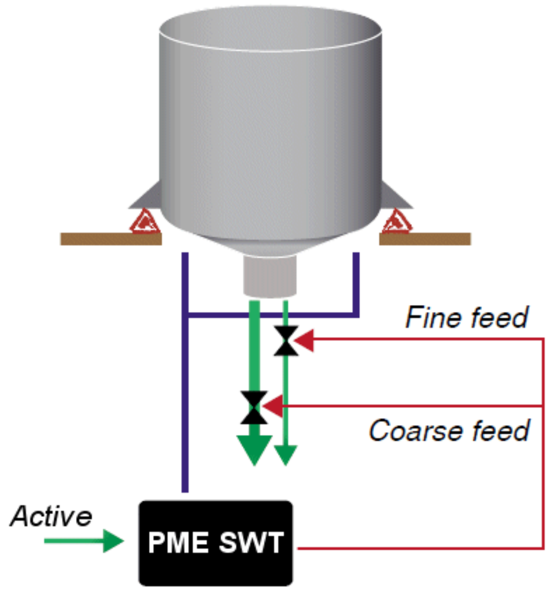
- illustration describing the output operating according to Filling direction with CF mode = S0+S1





- illustration describing the output operating according to Unloading direction with CF mode = S0



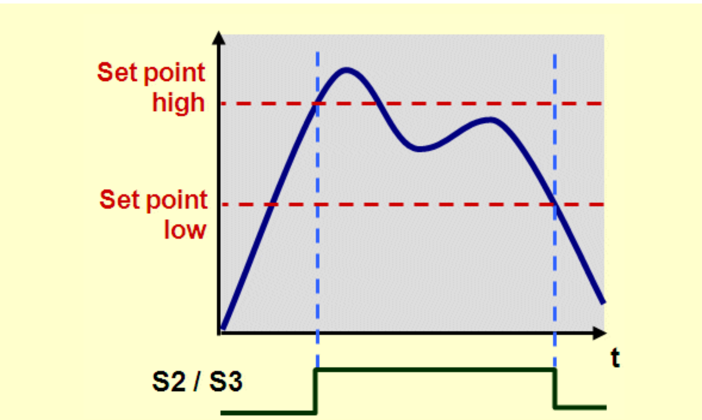


19.1.2. S2 and S3 output parameters

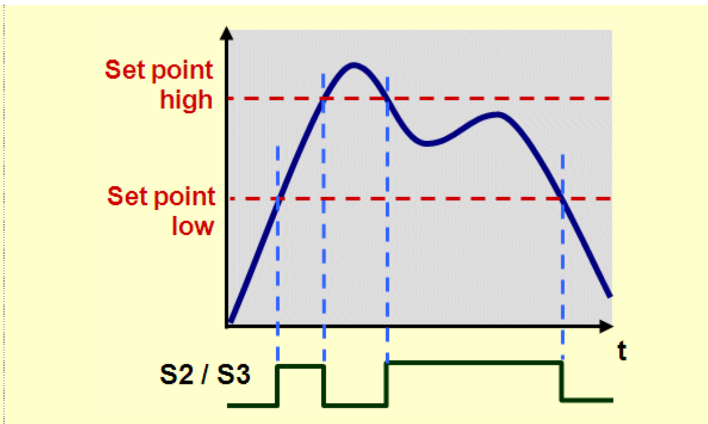
The threshold check manages the output Sx (x = 2 or x = 3) according to the following parameters:

Parameter	*Possible Value*	*Default*	*Description*
Sx Activation	*Enabled, disabled*	*disabled*	*Enable or disable the output management*
Sx Logic	*Positive, Negative*	*Positive*	*defines the edge (or level) that triggers input function*
Sx threshold mode	*Windows, Hysteresis*	*Windows*	*See diagram*
Sx Output Comparison source	*Net, Gross, Flow*	*Net*	*Define which value is checked with set point values*
Sx Set point High value	*0 to Max Capacity*	*0*	*Depending on the threshold mode, S2 and S3 outputs change state when these set points are met.*
Sx Set point Low value	*0 to Max capacity*	*0*	

Illustration describing the output operating according to threshold mode:



Threshold mode - Hysteresis



Threshold mode - Windows

20. Legal for trade

The legal for trade options are a set of functions and indicators that are generally used in weighing applications. They have an impact on the device behavior regarding the metrological requirements and track every configuration change that may affect the measurement determination.

NOTE

The PME SWT does not yet benefit from OIML approval for a use in legal for trade applications. Despite this, PME SWT was designed to comply with the OIML R76 recommendations.

20.1.1. Legal for trade parameters

Parameter	Possible Value	Default	Description
Legal for trade mode	*Yes / No*	*No*	*Enable or disable criteria and parameters related to the use in OIML compliance.*
Legal for trade Sealing	*Yes / No*	*No*	*Enable or disable the software sealing of metrological parameters concerned by OIML compliance*

20.1.2. Legal for trade Information (Read only)

Parameter	Possible Value	Default	Description
Legal counter	*0 to 65535*	*0*	*Automatically updated by the module (see above)*
Legal checksum	*0 to 65535*	*0*	

20.1.3. "Legal for trade" considerations

If 'legal for trade sealing' is activated, all the involved parameters will be available in read only, until the legal for trade sealing is deactivated.

At 'Legal for trade sealing' activation and deactivation, the 'legal for trade counter' is incremented, a new 'legal for trade checksum' is calculated and EEPROM storage is realized.

'Legal for trade sealing' activation is possible only if 'Legal for trade mode' is activated

The 'legal for trade mode' parameter activation leads to the following changes:

- The ratio "maximum capacity" divided by "scale interval" must be <6 000
- Tare function is impossible if gross measurement is negative.
- The range allowing making a Zero is reduced from ±10% to ±2% of maximum capacity
- The measurement value variations cannot be read during the 15 seconds that follow the device reset and during zero and tare acquisitions

Parameters involved by 'Legal for trade sealing'

- Legal for trade mode
- Stability criterion
- Zero Tracking and Initial Zero
- Scaling parameters (maximum capacity, scale interval, decimal point position, unit)
- Calibration parameters (Number of segments, Calibration loads 1/2/3, Global span adjusting coefficient, calibration place g value, place of use g value, sensor sensitivity…)
- Filtering parameters (A/D Conversion rate, Frequency rejection, Low pass order and cut off frequency…)

21. Calibration

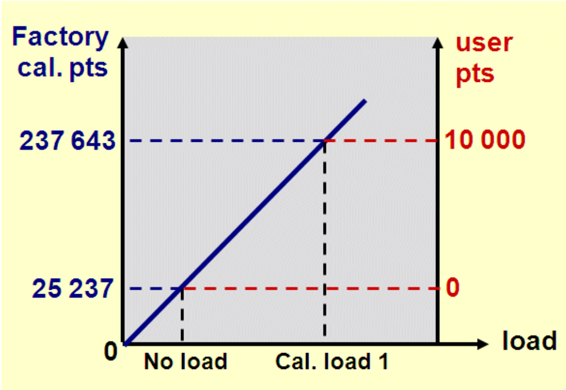
21.1. Introduction

The PME SWT is factory calibrated as following: **500 000 points for a 2 mV/V load cell input signal.**

Initial calibration can be modified for a better adjustment to the usage. All these adjustments refer to the factory calibration, allowing module replacement without a new adjustment of the scale.

To achieve these various types of adjustments the following options and procedures are available (See §7.3 for calibration commands):

- Physical calibration involving known loads to physically put on the weighing system.
- Theoretical calibration involving calculating the sensitivity of the load cell for the user-defined corresponding capacity.



CAUTION

In industrial context, because of the environment, choosing a resolution of more than 5 000 points assumes that there are rigorous installation precautions.

21.2. Calibration parameters

Parameter	Possible Value	Default	Description
Number of segments	*1 to 3*	*1*	*Defines how many calibration loads are used during the physical calibration.*
Calibration load 1/2/3	*1 to 1 000 000*	*0 / 0 / 0*	*User weight values corresponding to each calibration segment.*
Sensor sensitivity	*0 to 6.0000 mV/V*	*2.00000*	*Used to achieve theoretical calibration. Load cell sensitivity in mV/V at maximum capacity.*
Zero sensitivity	*-6 to 6.0000 mV/V*	*0*	*Used to achieve theoretical calibration. Load cell sensitivity in mV/V for the dead load.*
Calibration Zero	*0 to ± 1 000 000*	*0*	*Zero reference measured during a physical calibration. Also used for theoretical cal.*
Global span adjusting coefficient	*0.9 to 1.1000000*	*1.0000000*	*Allows to adjust initial calibration*
calibration place g value	*> 0*	*9.805470*	*Allows compensating the gravity difference between calibration place and using place.*
Place of use g value	*> 0*	*9.805470*	*Allows compensating the gravity difference between calibration place and using place.*
Span coefficient 1/2/3	*> 0*		*Automatically produced during calibration. Allows to restore a previous calibration*

21.2.1. Calibration loads 1/2/3

Before starting a physical calibration procedure, each calibration segment must be given a corresponding user value (for example, 1000 points for a 1 kg load).

21.2.2. Sensor sensitivity

The *'sensor sensitivity'* setting is used to achieve a theoretical calibration. The stored value for this parameter is the **load cell sensitivity in mV/V** for the low-level analog channel

The user can adapt the value delivered by ***PME SWT*** for the associated signal using the *'maximum capacity'* and the *'sensor sensitivity'*.

This setting is expressed with a 10^{-5} factor (197500 is equivalent to a 1.975 mV/V load cell sensitivity or a 1.975 V input voltage).

21.2.1. Zero sensitivity

The *'Zero sensitivity'* value contains the offset in factory calibrated points that can be added/subtracted (if its value is positive or negative) to the zero calibration value when using the *'zero sensitivity'* functional command. Once the command has been successfully achieved, this register is set to 0.

Note: The 'Zero sensitivity' value is not stored into EEPROM memory and is always equal to 0 after a device power-up or a software reset

21.2.2. Calibration Zero

Calibration Zero value corresponds to the A/D converter points measured during the '*zero acquisition*' step of a physical calibration.

For a theoretical calibration this value must be set. It can be set automatically with the '*zero* ' command.

Note: To be applied, any modification of this setting must be followed by an EEPROM back up and device reboots (hardware or software).

21.2.1. Global span adjusting coefficient

The *'span adjusting coefficient'* allows adjusting initial calibration. Adjustment applies linearly on the whole calibration curve. This coefficient has a 10^{-6} factor (1000000 is equivalent to a span adjusting coefficient that is equal to 1).

Note: To be applied, any modification of this setting must be followed by an EEPROM back up and device reboots (hardware or software).

21.2.1. Calibration place g value / place of use g value

When the calibration place and the place of use of a measuring chain are different, a deviation can appear due to the difference of g (gravity) between the 2 places.

The PME SWT calculates a ratio applied to the measure which compensates the difference of gravity between the 2 places.

The g value are expressed in 10^{-6} $m.s^{-2}$ (9805470 is equivalent to g = 9.805470 $m.s^{-2}$).

Note: To be applied, any modification of this setting must be followed by an EEPROM back up and device reboots (hardware or software).

21.2.2. Span coefficients 1/2/3

These coefficients are computed and written during calibration process. Writing these coefficients could be done if you want to restore a previous calibration.

Note: To be applied, any modification of this setting must be followed by an EEPROM back up and device reboots (hardware or software).

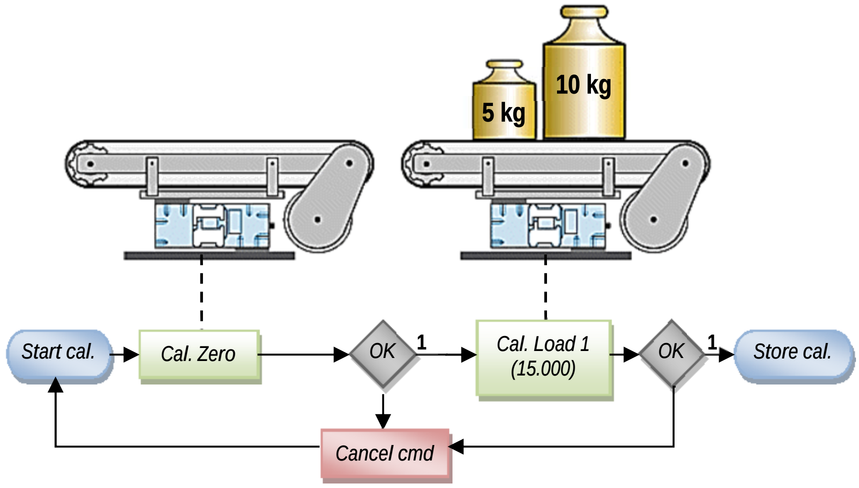
21.3. Physical calibration

21.3.1. Physical calibration commands

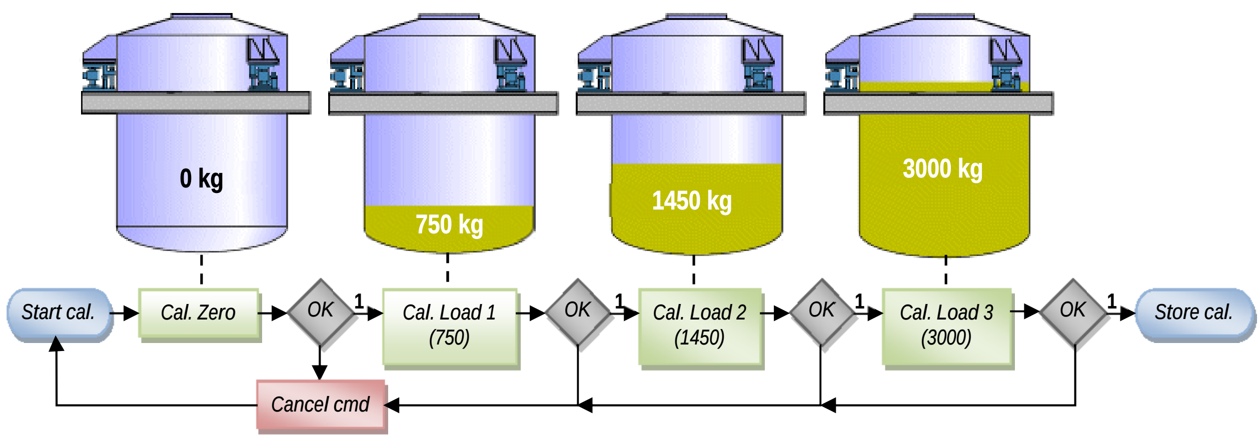
Command	Parameters	Description
Start Physical calibration	-	*First step of the sequential calibration procedure.* *Set PME SWT in calibration mode.*
Physical calibration Zero	-	*Second step of the physical calibration procedure.* *This step consists to acquire stable measurement with no load on the scale. If stability is not reach after 5 seconds, the command is cancelled and error is reported.*
Phy. Cal. load 1 **Phy. Cal. load 2** **Phy. Cal. load 3**	*number of calibration loads,* *Calibration load 1 2 / 3*	*Next steps consist to acquire stable measurements with known loads (value in corresponding parameter) placed on the scale by sending the 'Phy. cal. load X' command where X depends on 'number of calibration segments' parameter* *If stability is not reach after 5 s, the command is cancelled.*
Store calibration	*Zero cal.* *Calibration span 1 / 2 / 3*	*Only if all the previous steps were successful, next step consists in storing the calculated calibration parameters in EEPROM.*

Physical Calibration procedure

number of calibration load = 1

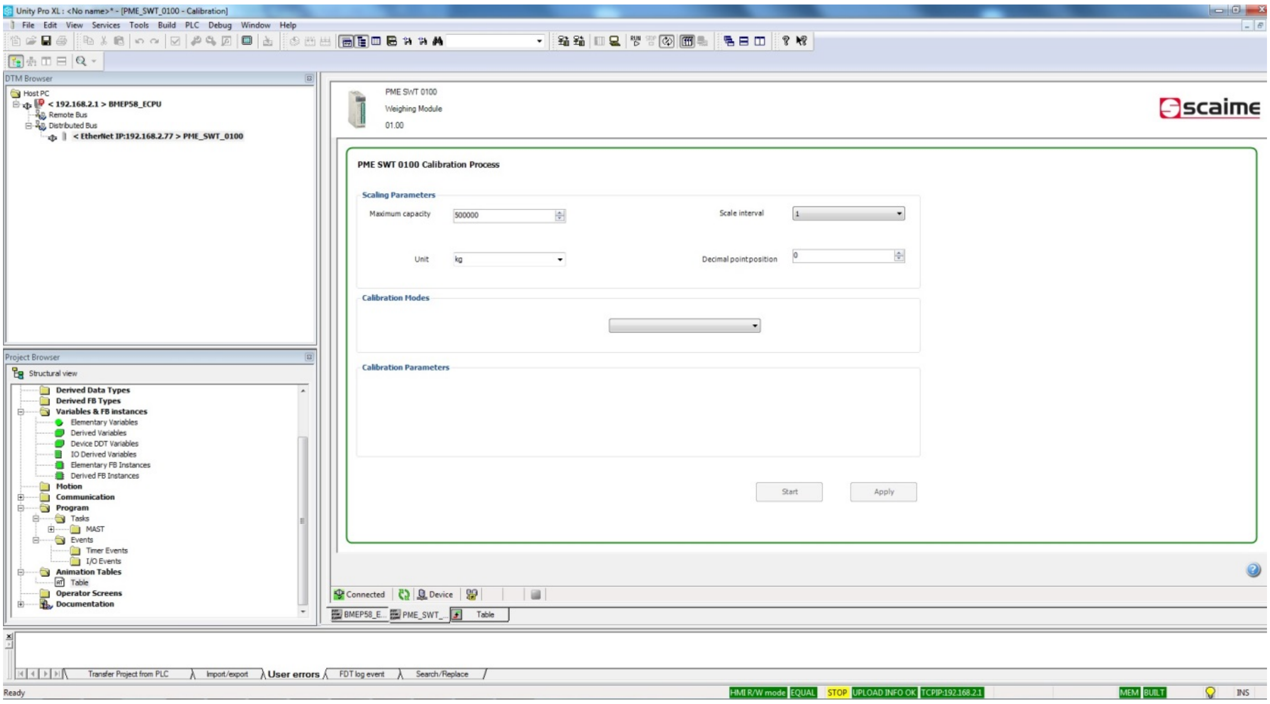


Physical Calibration procedure with number of calibration load = 3

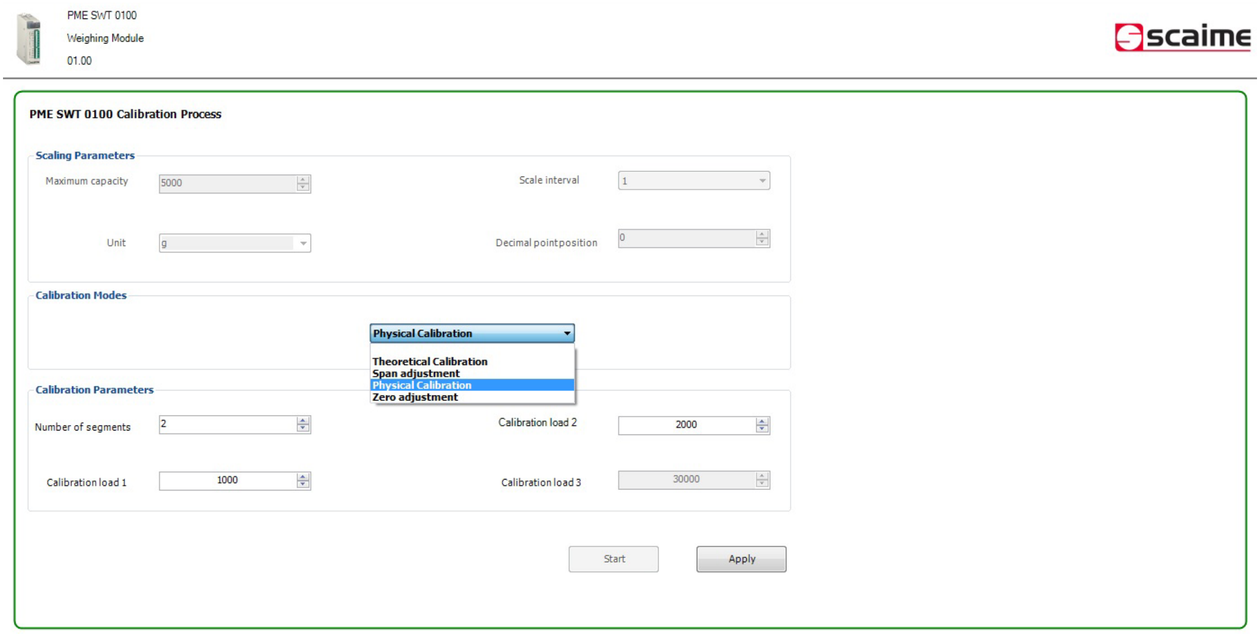


21.3.2. Physical calibration example

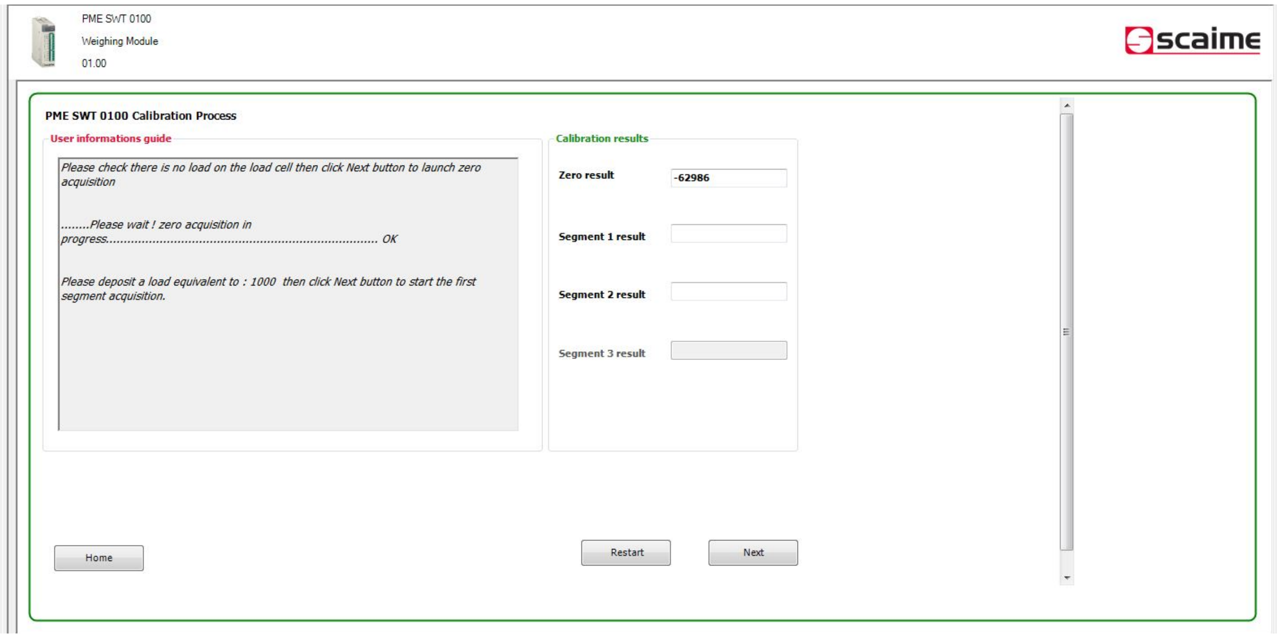
- Open calibration windows (PME SWT -> Device menu -> Additional functions -> calibration)



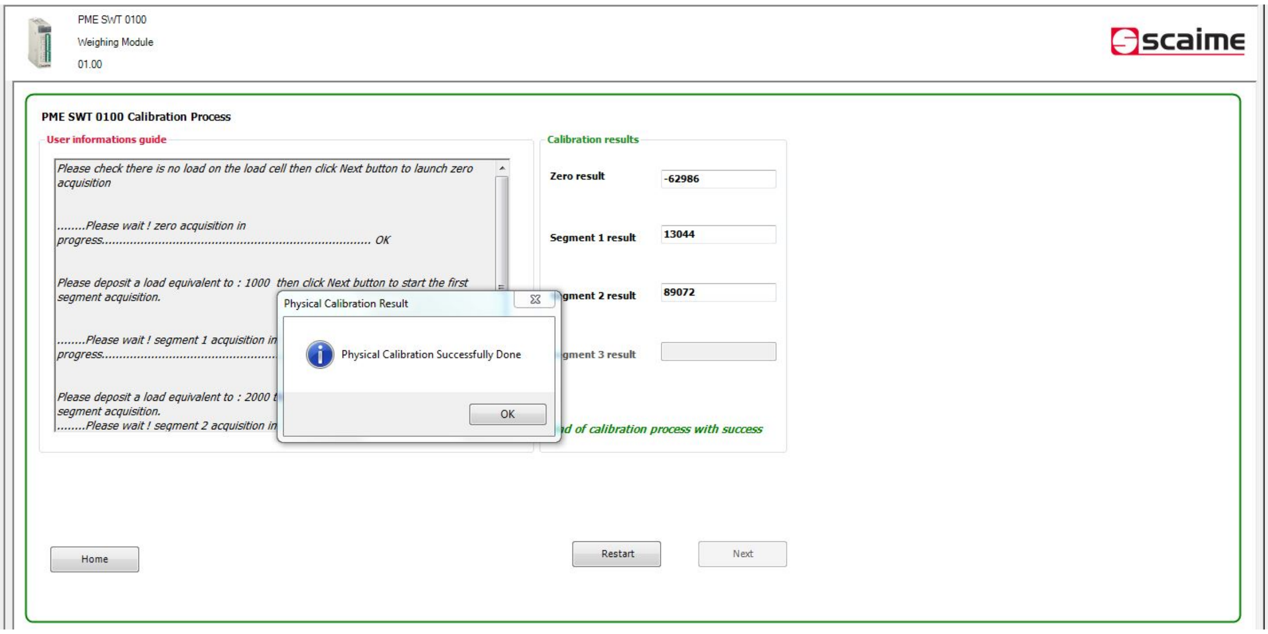
- Choose the maximum capacity (ex 5000 for a 5 kg scale -> gram precision)
- Choose the "Unit" ("g" in this example), the "decimal point position" (0 in this example), and the "scale interval" (1 to display every gram in this example). These parameters are for display.
- Select "physical calibration":



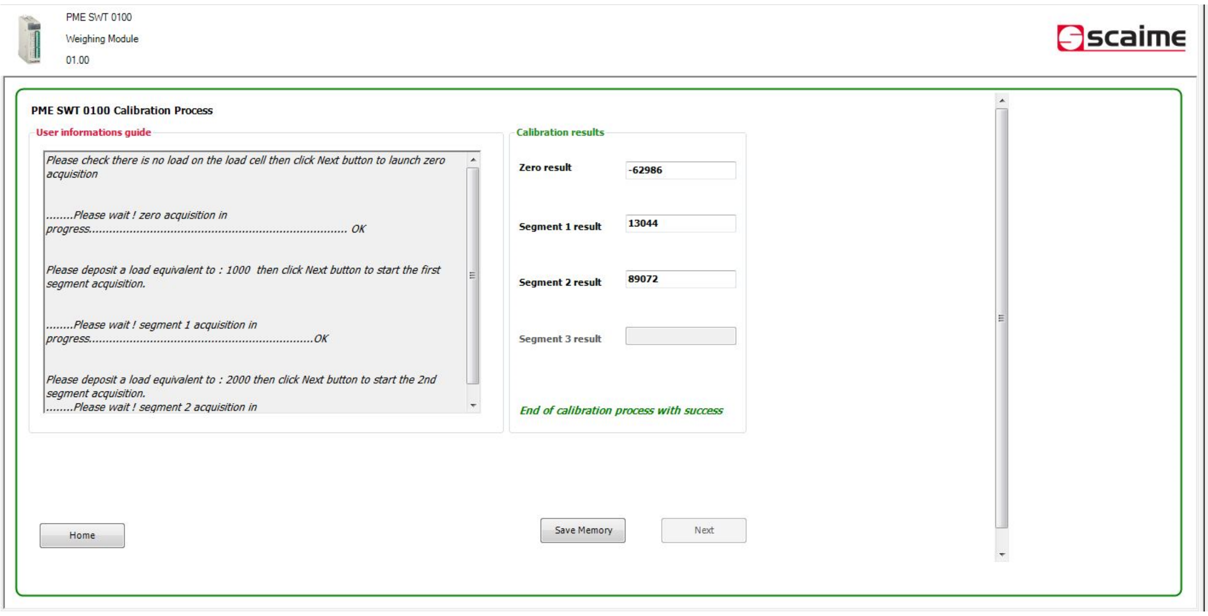
- Choose the "number of segments" according to the number of loads you have for calibration (up to 3, this example is 2).
- Change the "calibration load 1, 2 and 3" values according to the loads you have (unit is the "maximum capacity" unit: in this example maximum capacity is 5000 for 5 kg, so with 2 loads of 1 kg, write "1000" in "Calibration load 1", and "2000" (2 x 1 kg) in "calibration load 2").
- Click "Apply", "Start" and follow the instructions written on the window:
- Remove load, then click next
- Wait for the "OK" message, and put your first load down on the scale, then click next



- Wait for the "OK" message, and add your second load on the scale, then click next



- Click "Ok" to end the physical calibration
- Physical calibration is successfully done. This calibration will be erased after a reset. If you want to keep it after a reset, click on "Save memory" (save into the EEPROM of the PME SWT).


PME SWT 0100
Weighing Module
01.00
scaime
PME SWT 0100 Calibration Process
User informations guide
Please check there is no load on the load cell then click Next button to launch zero acquisition
........Please wait ! zero acquisition in progress.. OK
Please deposit a load equivalent to : 1000 then click Next button to start the first segment acquisition.
........Please wait ! segment 1 acquisition in progress...OK
Please deposit a load equivalent to : 2000 then click Next button to start the 2nd segment acquisition.
........Please wait ! segment 2 acquisition in
Calibration results
Zero result
-62986
Segment 1 result
13044
Segment 2 result
89072
Segment 3 result
End of calibration process with success
Home
Save Memory
Next

21.1. Partial Physical calibration

21.1.1. Zero adjustment commands

Zero adjustment	*Parameters*	*Description*
Zero adjustment	-	*Allows acquiring stable measurement with no load on the scale to set the calibration Zero.* *If correctly achieved, this calibration zero must then be saved by the 'store calibration' command.* *This command can be used any time and has no effect on the span.*

21.1.2. Zero adjustment example

- Select "Zero adjustment"
- Check that you do not have any load on the scale.
- Click "start" to start calibration and store in EEPROM.
- Zero adjustment is done. Click "ok" to end.
- This calibration will be erased after a reset. If you want to keep it after a reset, click on "Save memory" (save into the EEPROM of the PME SWT).

21.1.3. Span adjustment commands

Span adjustment	*Parameters*	*Description*
Span adjustment	*Calibration load 1*	*Allows acquiring stable measurement with known load on the scale to set the calibration span. If correctly achieved, the number of calibration load is set to 1 and calibration span 1 is calculated.* *this calibration span must be saved by the 'store calibration' command.* *This command can be used any time and has no effect on the current calibrated zero.*

21.1.4. Span adjustment example

Span adjustment is usually done after a Zero adjustment. Sometimes you cannot do both at the same time (Silo filling for example). This is why theses commands can be done separately.

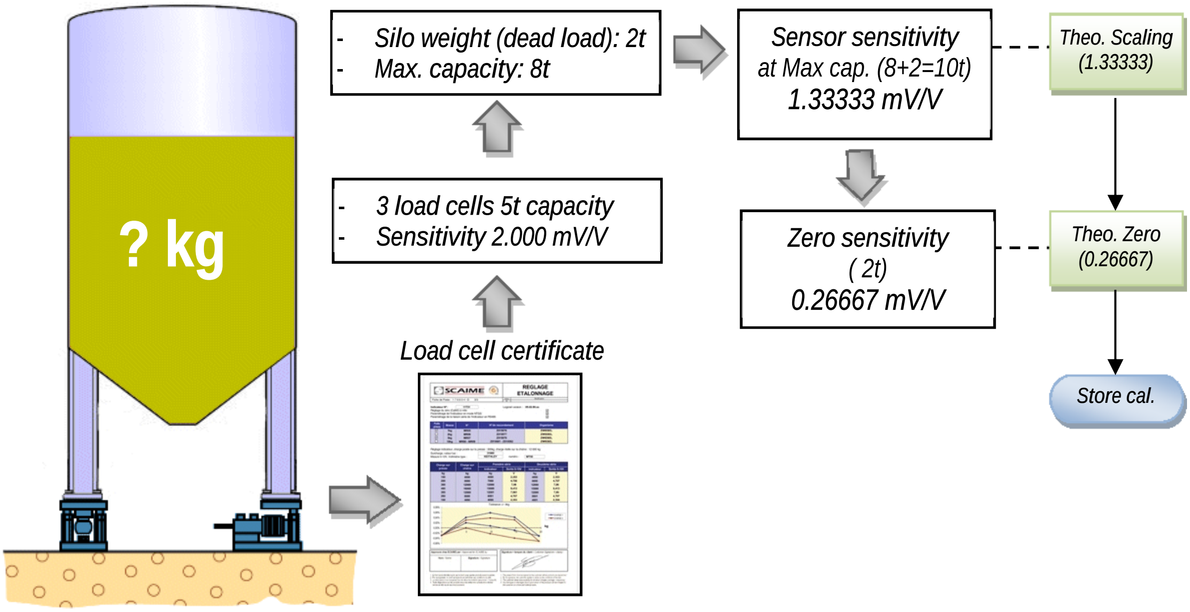
- Select "span adjustment"
- Change the calibration load, according to the load you have for calibration
- Click "Apply" to send to the device, and "start" to start calibration.
- Span adjustment is done. Click "ok" to end.
- This calibration will be erased after a reset. If you want to keep it after a reset, click on "Save memory" (save into the EEPROM of the PME SWT).

21.2. Theoretical calibration

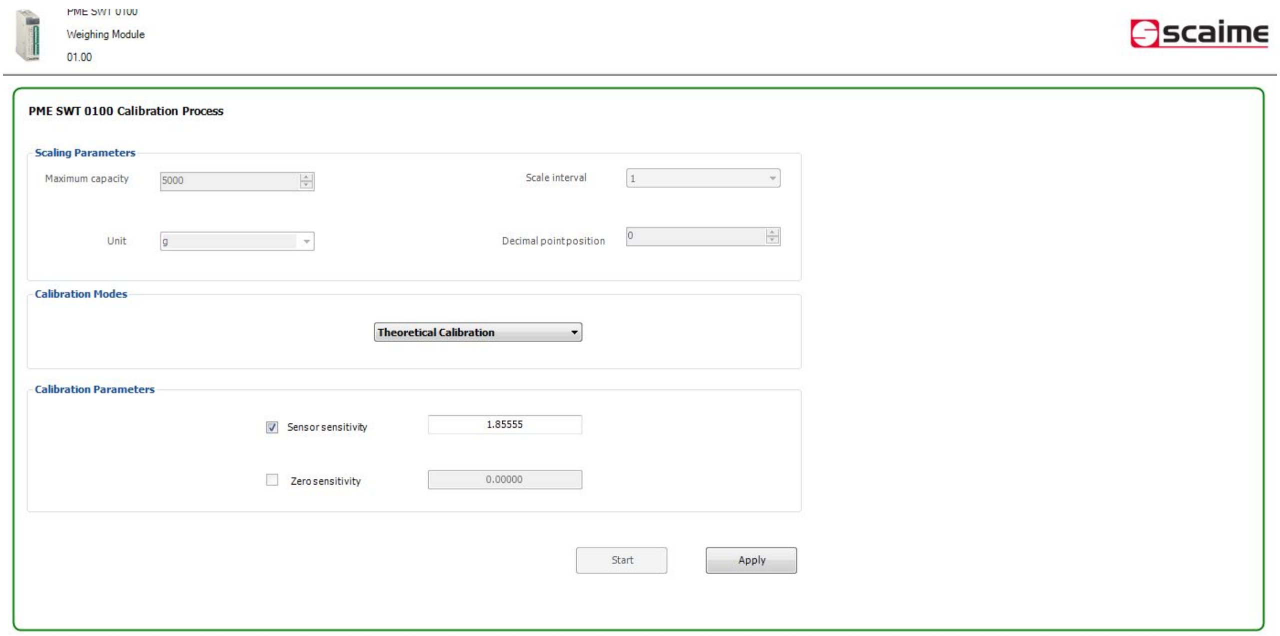
21.2.1. Theoretical calibration commands

Command	Parameters	Description
Theoretical scaling	*Sensor sensitivity,* *maximum capacity*	*This command involves the 'maximum capacity' and the 'sensor sensitivity' settings. An automatic scaling to migrate from the factory calibration to the user calibration.* *This calibration must be saved by the 'store calibration' command.*
Theoretical Zero	*Zero sensitivity*	*From the 'Zero sensitivity 'parameter, this command calculate the zero in factory calibration pts.* *This calibration must be saved by the 'store calibration' command.* *This command can be used at any time and has no effect on the span.*

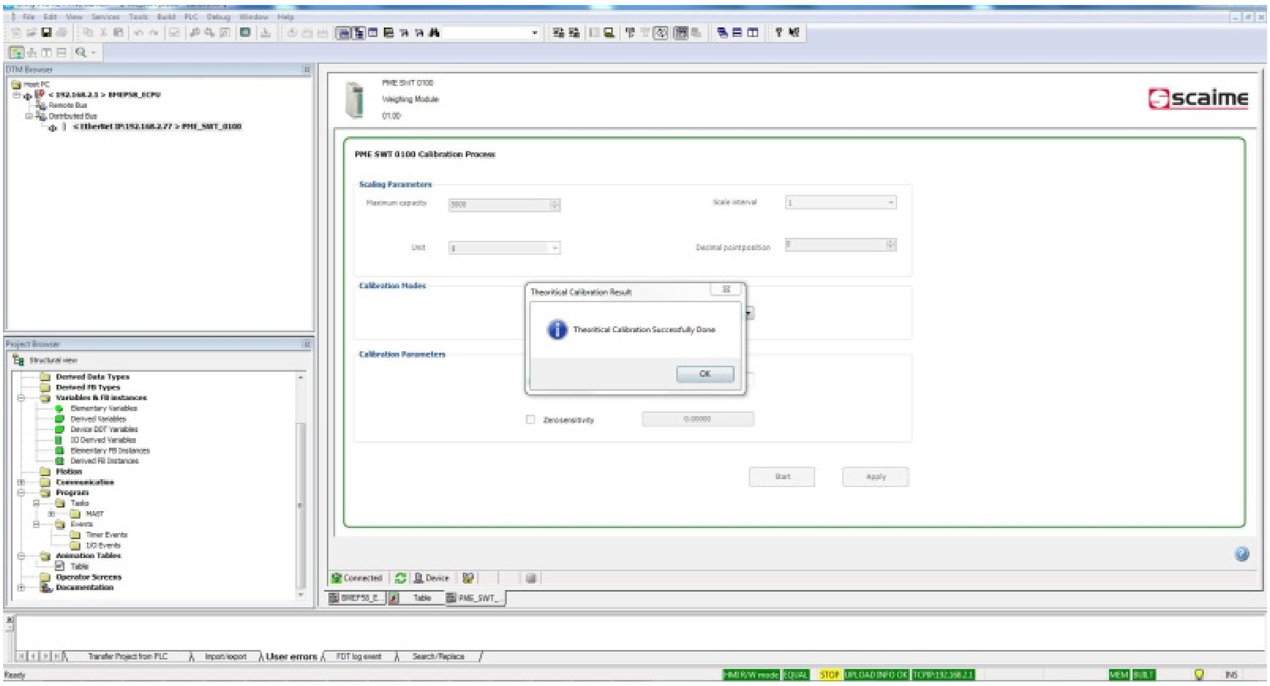
These commands are used for example to calibrate a silo impossible to empty or fill with a known load:



21.2.2. Theoretical calibration example



- Select « theoretical calibration » and change the « sensor sensitivity » (unit is mV/V at maximum capacity) or the « Zero sensitivity » (unit is mV/V without any load). Click « Apply » to send parameters to the PME SWT. You can usually find these parameters value on the calibration reports of the load cells (or sensor).
- Click “start” to start calibration with the parameters and store in EEPROM.



- Theoretical calibration is done. Click ”ok” to end.
- This calibration is automatically saved in EEPROM (keep after reset).